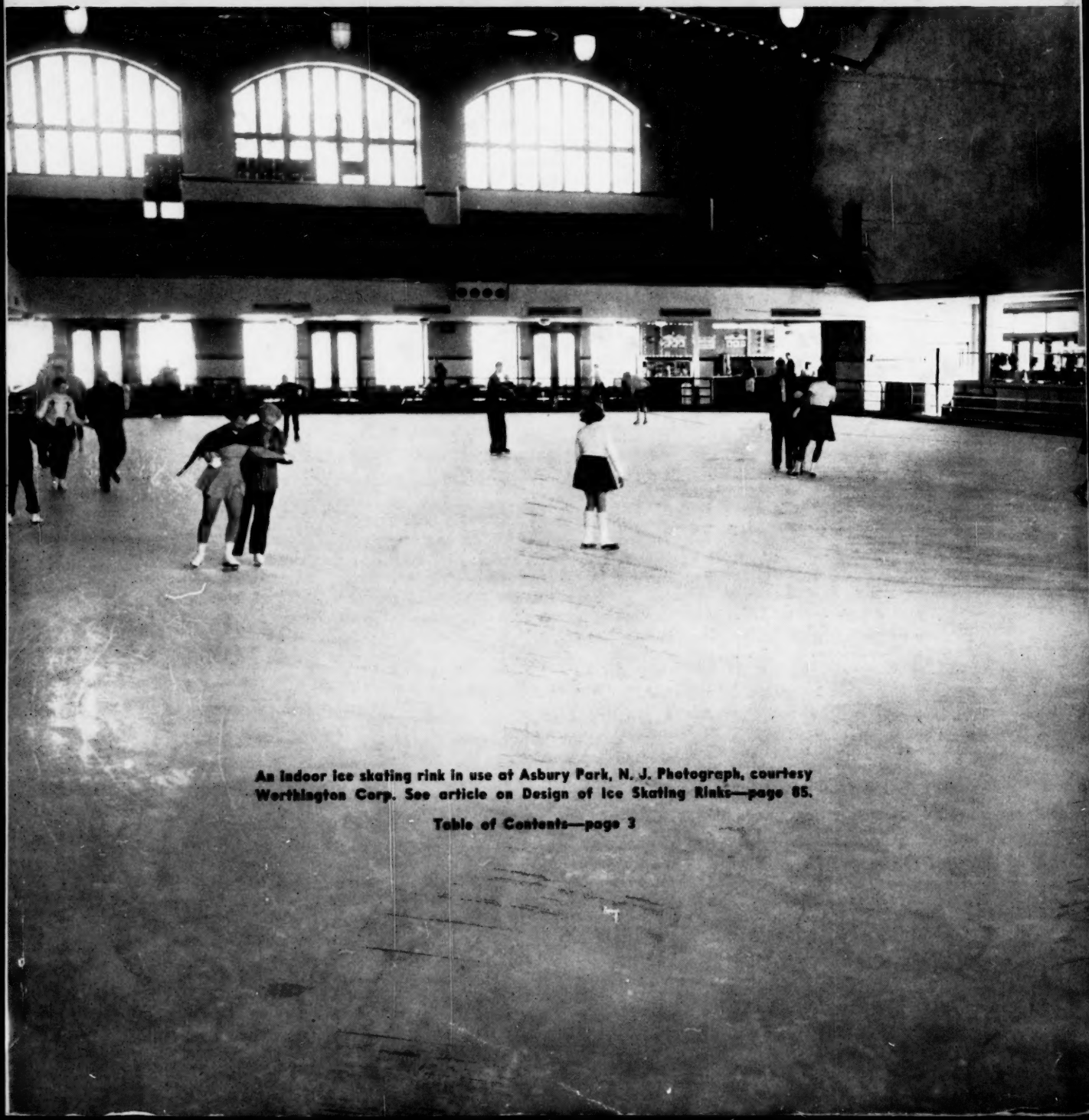
# AIR CONDITIONING HEATING AND VENTILATING

OCTOBER, 1956—53rd Year



An indoor ice skating rink in use at Asbury Park, N. J. Photograph, courtesy Worthington Corp. See article on Design of Ice Skating Rinks—page 85.

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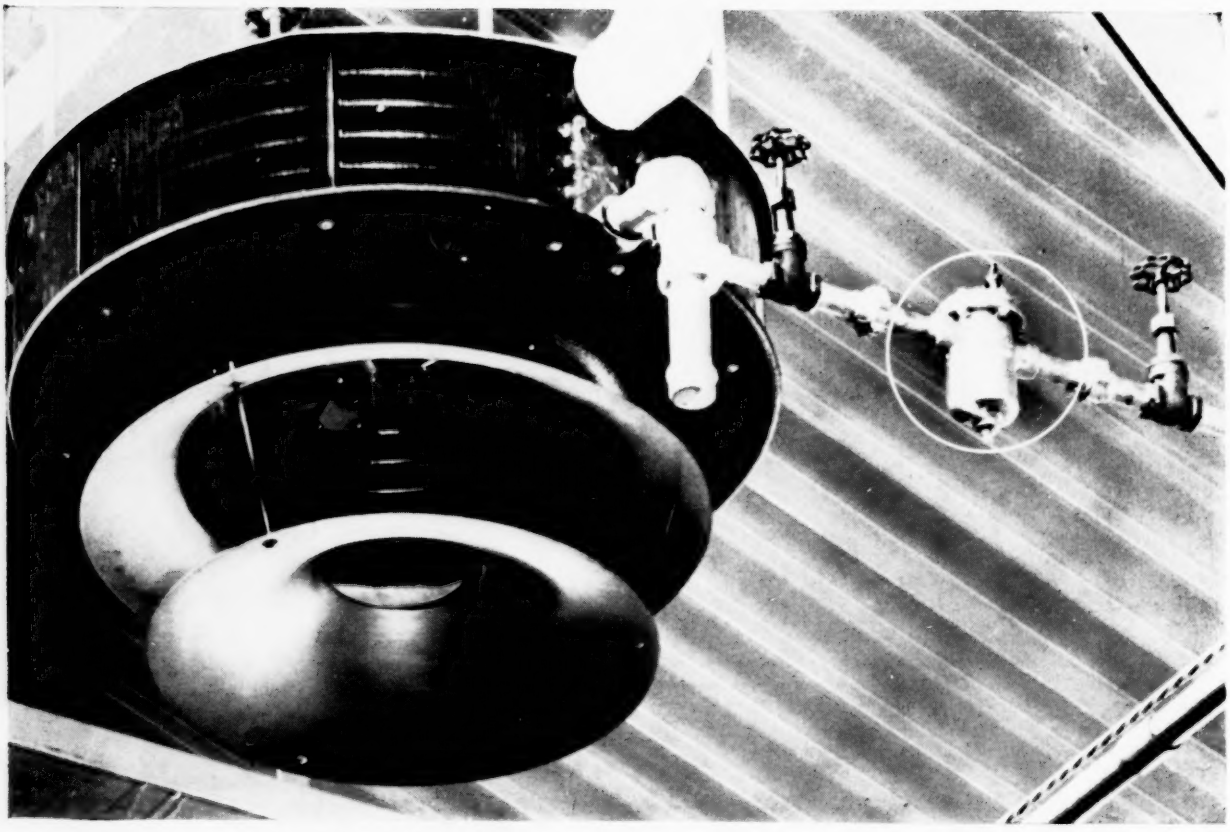


# Here's the Way to Trap a Unit Heater for Lots of Heat and Little Maintenance

The picture above is an outstanding guide to good unit heater trapping. This installation provides maximum heater efficiency and minimum maintenance time and cost.

**1. Simplified piping.** Horizontal in-line piping is made possible by the Armstrong side inlet—side outlet trap body. Note that the trap can be opened by removing the cap, without disturbing pipe connections.

**2. Dirt pocket ahead of trap.** The vertical pipe leg collects heavy dirt and scale. No strainer is needed because the self-scrubbing action of an Armstrong trap washes ordinary dirt right through it.

**3. Test valve.** The maintenance engineer can check this trap quickly and easily by opening the test cock shown installed in the trap cap.

**4. Shut-off valves and unions.** The trap can be repaired, or replaced with a spare trap, without shutting off any other units.

**5. Generous sized trap.** The Armstrong trap, selected from Table B-29 or C-29 in The Armstrong Steam Trap Book, provides a minimum safety factor of 3 to 1 for this job. Its big air handling capacity keeps the heater free of corrosion-producing air and $CO_2$, provides fast heat-up and full rated btu output. No lag—condensate is discharged at steam temperature.

**6. A good steam trap.** The Armstrong trap discharges condensate at steam temperature and it has large air venting capacity. The heater is always full of hot, dry steam.

The Armstrong trap mechanism cannot clog, bind, stick or collapse. Valve and seat are hardened chrome steel—all other working parts are stainless.

An Armstrong trap is rated conservatively on a basis of actual hot condensate capacity under job operating conditions. This is not true of all traps and is an important factor when comparing prices.

Armstrong traps are sold by factory-trained Representatives under an unconditional, money-back guarantee of satisfaction to the user.

For the best in unit heater trapping, call your local Armstrong Representative, or write:

**ARMSTRONG MACHINE WORKS**
846 Maple Street • Three Rivers, Michigan

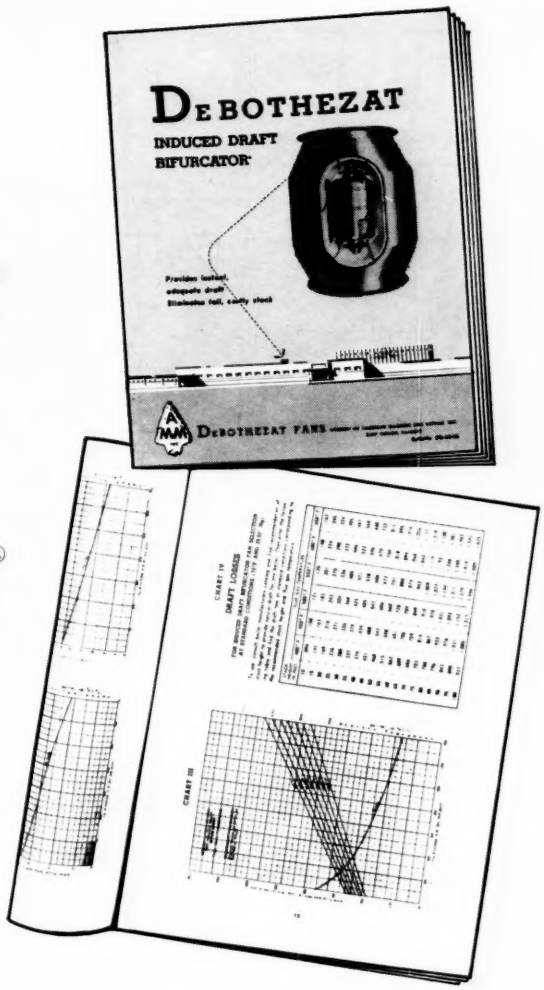
FREE — "How to Trap Unit Heaters" is the title of pages 28 and 29 in The Armstrong Steam Trap Book. This 44-page catalog is a guide to good trapping practice. Send for your copy.

STEAM TRAPS FOR EVERY REQUIREMENT — APPLICATION ENGINEERED

**ARMSTRONG STEAM TRAPS**

# NEW DeBOTHEZAT INDUCED DRAFT BIFURCATOR® CATALOG

## all boiler code ratings expressed in BTU/HR




A valuable working tool for both the engineer and contractor. This new 20-page catalog gives all manufacturers' organizations boiler code ratings reduced to their common relationship of BTU/HR delivered to the steam.

Also included are useful tables and charts on volume of flue gas for oil, gas and coal. Facts are given on the selection, use and installation of Induced Draft Bifurcator Fans. Performance data and complete specifications on all DeBothezat Induced Draft Bifurcators are outlined in detail.

De Bothezat FANS
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Prospects for the Webster Moderator System are everywhere. In one downtown block of a midwestern city, a recent survey showed 17 steam-heated buildings without central, automatic, continuous-flow control. The same situation is duplicated in major cities from coast to coast. All of these prospects – and many of them may be *your* prospects – can save money, simplify heating plant operation and gain new heating comfort with a Webster Moderator System.

Here is the weather-controlled continuous steam flow system that actually pays for itself in fuel savings. Introduced by Webster in 1927, the system has been constantly improved in details without altering the basic soundness of its original principle. And today's new electronic Webster Moderator System assures economical, winter-long comfort to match the summer-long luxury of modern Webster Air Conditioning.

For steam-heated buildings old or new, investigate the fuel-saving, comfort-producing advantages of the Electronic Webster Moderator System. See your Webster Representative, or write us.

Address Dept. HV-10

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TRADE MARK REG. U.S. PAT. OFF.
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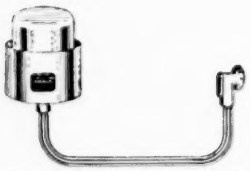
**OF STEAM HEATING**
**"Controlled by the weather"**



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Webster Variator provides convenient manual control when desired.

Main Steam Control Valve graduates or throttles amount of steam admitted to the system. Balancing of steam distribution is achieved by means of accurately sized metering orifices in radiator supply valves.

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In Canada, Darling Brothers, Ltd., Montreal

# AIR CONDITIONING HEATING AND VENTILATING

OCTOBER, 1956

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**The Cover:** The Casino Ice Palace rink at Asbury Park, N. J. See "Design of Ice Skating Rinks" by C. V. Bengle, beginning on page 85.

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*Pressure- Temperature Relief* Valves

Commercial, Industrial, and Institutional buildings all have a hot water supply system. As indicated by the latest requirement standards according to the 1955 Addenda to A.S.M.E. Boiler and Pressure Vessel Code, these hot water supply systems need TEMPERATURE protection as well as PRESSURE protection. Watts has a Complete Line of the finest A.S.M.E. Rated and Certified COMBINATION T & P RELIEF VALVES or plain A.S.M.E. Rated PRESSURE SAFETY RELIEF VALVES for complete protection of hot water supply systems.

For more detailed description of these products and their applications send for folder F140A.

## 140 240 SERIES

*Oldest and Most Experienced Manufacturer*

**of Automatic Reseating Temperature and Pressure Relief Valves**

# HIGH SPOTS

• Corporate Sales: **Flintkote Co.,** roofing manufacturer, has purchased **Van-Packer Corp.,** maker of prefabricated chimneys; **Servel's** assets and facilities for manufacture of refrigeration compressors have been bought by **Bendix-Westinghouse Air Brake Co.; Plasteel** division of P. R. Malloy Plastics, Inc., purchased by **Ekco Products Co.** Plasteel makes line of plastic bathroom accessories.

• Nearly a half million dollars worth of G-E **packaged air conditioning** equipment, the largest single order on record for that company's commercial and industrial air conditioning department, were used in the new men's clothing plant of H. Daroff and Sons, Inc., Philadelphia, manufacturers of Botany 500 and Worsted-tex suits.

• A new **application engineering** standard (No. 530) for **air-conditioning multi-zone factories,** office buildings, and similar structures in which varying degrees of cooling and humidity must be maintained, is issued by Air-Conditioning and Refrigeration Institute, 1346 Connecticut Ave., N. W., Washington 6, D. C. Limited to the setting of minimum conditions and factors that form the basis of design load estimating and specifications of performance for such installations, the bulletin is free. Among contents are: Design load factors for inside and outside conditions, sensible heat gain through glass, transmission, heat gain from occupants, heat gain from appliances, ventilation and infiltration, air motion in conditioned spaces, capacity specifications, cooling load calculations, multi-zone building refrigeration loads, heating load calculations and safety provisions.

• **Air-borne corrosive agents and humidity** are primary cause of damage to **museum displays,** according to V. P. Logan Lewis, Carrier Corp., in a paper before American Association of Museums in Cincinnati. These agents infiltrate museums through windows and doors, and particles of lint which absorb water when floating in air are released into the atmosphere from clothing of visitors. Corrosive agents are often activated by a humid atmosphere, and tend to eat at the surface of art treasures on display. Lint particles tend to gather in places such as under rivets or picture frames where they collect moisture or mold and fungi spores, and hasten the aging process.

• A 3-day **air conditioning engineering institute,** November 14-16, designed for those employed in industry to help them keep abreast of developments, is scheduled by the Extension Div., The University of Wisconsin, Madison, Wis. Cooperating are University's College of Engineering and ASHAE. Fee is $25.

• **Heating, ventilating and plumbing engineers** seeking positions in the Southwest are invited to communicate with the Bureau of Indian Affairs, Branch of Buildings, and Utilities, Box 1777, Albuquerque, N. M., attention John T. Finley, Assistant Chief. Several positions are open.

• Sales of **room air-conditioners** during the 1956 summer season will exceed the 1,500,000 units forecast early in the year, reports Geo. S. Jones, Jr., managing director of Air-Conditioning and Refrigeration Institute, on the basis of preliminary figures gathered by the ARI. Last year's sales amounted to about 1,300,000 units.

• Hemeon Associates, Pittsburgh air pollution consultants, has appointed **Harold M. Ide,** recently of Mellon Institute, to head up area surveys and laboratory work.

# WASHINGTON OVERTONES

by LORING OVERMAN

September brought with it no scarcity of Washington's most common commodity **—controversy**

Even with Congress adjourned, echoes of recent Senate-House actions reverberated from agency to agency. And in preparing for the new Congress to convene January 3, committees, political leaders and industry representatives were busy priming pumps, greating skids, and sending up trial balloons for pet projects.

• **Housing industry** folks, for example, were complaining that Federal Reserve officials must be misinterpreting what Congress meant when it passed the **Omnibus Housing** bill during closing days of the 84th session.

• Construction people have viewed the legislation as intended to further encourage the **"more than a million starts per year"** concept of home building. Federal Reservers have been accused of braking the money market to a point where it is impossible to keep the housing vehicle moving at that pace.

• **Proposed by housing industry** representatives: an immediate Government-industry conference "to provide prompt corrective action." Suggested as conferees: top-level representatives of Treasury, Federal Reserve Board, President's Council of Economic Advisors, Federal Housing agencies, and housing industry.

• Meanwhile, Bureau of Labor Statistics reported for August — **101,000 housing units started;** same number as in July, and without the seasonal dip usually noted in August.

• August figure represents first comparative upturn in three months. Brings total for year to 783,000 starts — **20 percent below same period last year,** but at annual rate of 1,110,000 starts for the year if present pace continues.

• The **commercial** and **industrial** building field more than **takes up any slack** reported for housing.

• Recent Government figures (Securities and Exchange Commission) report third quarter spending at an annual adjusted rate of $36.26 billion — **far ahead of the $34.9 billion forecast** some months ago by the Commerce Department. Indications are that, if present expenditures continue, the fourth quarter total may reach $38 billion — for an annual total of $35.39 billion.

• Higher prices for materials and labor explain much of the jump, but the **increase in physical volume** may reach 20% for the year; possibly four percent in the last quarter.

• Observers point out that construction in general — both residential and commercial-industrial — are proceeding at near-capacity levels insofar as materials and labor are concerned. Both cement and steel construction shapes are short, and skilled labor is scarce.

• Thus any **1956 construction deferred** by shortages may be expected to carry over to **form a backlog** for 1957 — hardly missed this year.

• Political party platforms promise (D) to reduce individual income taxes by increasing personal exemptions to at least $800, and (R) to seek tax reductions in lower brackets if budget can be balanced. Therein lie the seeds of **another great Washington controversy.**

• Already three Ways and Means Subcommittees have scheduled hearings to consider possibilities.

• September hearings were held by a Subcommittee on Customs, Tariffs and Reciprocal Trade Agreements. Late November hearings have been announced by Chairman Forand (D-RI) of Subcommittee on Excise Taxes and Rep. Mills (D-Ark), on Internal Revenue Taxation.

*(Continued on page 8)*

# DIVIDE and CONQUER

## HOT WAR - COLD WAR

This well known military tactic finds scientific and practical application in the HOT WAR of summer with invasion of heat, and the COLD WAR of winter with heat loss from buildings.

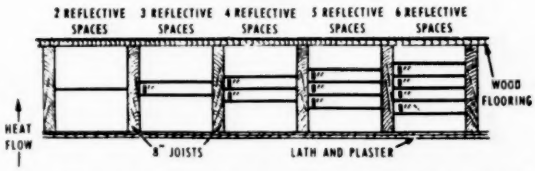
For a marked increase in insulating value because of a marked reduction in heat flow by convection upward and laterally, divide the depth of joist spaces into multiple shallower spaces. This important scientific contribution, the result of research by H. E. Robinson and F. J. Powlitch, under the direction of R. S. Dill, all of the National Bureau of Standards, was published by the Housing & Home Finance Agency under the title, "The Thermal Insulating Value of Air Spaces, Research Paper 32."

They report that as the temperature difference between bounding surfaces in an air space decreases, convection also decreases. The more the space is subdivided, the greater is the *division of the original spread of temperature.* Therefore each space carries a *smaller burden of temperature difference*, and has greater insulating value. This is true down to about 1".

### LAW OF APPRECIATING RETURNS

For this reason, for heat flowing in the up and lateral directions, successive reflective spaces, one behind the other, follow a law of *appreciating* returns. Each reflective space thus formed follows a pattern of increasing insulating value as the number of subdivisions of the joist space increases.

*Each* 1" reflective space where the joist space has been subdivided in six parts, has greater insulating value than each similar 1" space where it has been subdivided in 5 parts; which in turn has greater value than each such 1" space where there are 4 subdivisions, etc.




The total insulating value in an 8" space of 6 such reflective spaces is *more than twice* that of 3 such spaces, *over 50%* better than 4.

### GREATEST HEAT FLOW BY RADIATION

The greatest flow of heat across building spaces is by Radiation. When aluminum subdivides joist spaces into successive reflective spaces, heat flow by radiation as well as convection is also drastically reduced, because aluminum surfaces have 97% reflectivity, and 3% absorptivity and emissivity for heat rays. Conduction is slight through the low density air spaces.

The Thermal Factors below were calculated by Infra engineers, with the use of Research Paper 32. The ceiling joist was taken as $7\frac{5}{8}$"; floor joist $9\frac{5}{8}$"; wall stud $3\frac{5}{8}$" for 3 and 4 spaces, $5\frac{5}{8}$" for 5 and 6 spaces. The roof was taken as asphalt shingles or roll roofing on $^{25}/_{32}$" solid wood sheathing. Air temperatures were assumed as follows:

| | Heat Flow | Inside Temp.—°F | Outside Temp.—°F | Mean Temp.—°F | Temp. Diff.—°F |
|---|---|---|---|---|---|
| Walls | side | 70 | 0 | 35 | 70 |
| Ceilings | up | 80 | 10 (attic) | 45 | 70 |
| Ceilings | down | 90 | 120 (attic) | 105 | 30 |
| Floors | down | 65 | 30 | 48 | 35 |

## THERMAL FACTORS FOR PARALLEL REFLECTIVE AIR SPACES

(In Btu per sq. ft., per hour, per degree F)

Where Dividing Media are ALUMINUM with .03 emissivity, and PAPER, spaced 1" apart.

Calculated on the basis of work done by the National Bureau of Standards
For Housing & Home Finance Agency's Research Paper No. 32

| Number of REFLECTIVE SPACES | UP-HEAT C FACTOR | UP-HEAT R FACTOR (=1/C) | UP-HEAT U FACTOR Ceiling & Roof (unfloored attic) | DOWN-HEAT C FACTOR | DOWN-HEAT R FACTOR (=1/C) | DOWN-HEAT U FACTOR Ceiling & Roof (unfloored attic) | DOWN-HEAT U FACTOR Floor over Crawl Space | SIDE-HEAT C FACTOR Wall | SIDE-HEAT U FACTOR Wall |
|---|---|---|---|---|---|---|---|---|---|
| 3 REFLECTIVE SPACES<br>2 aluminum foils . 1" apart | .141 | 7.10 | .101 | .049 | 20.43 | .038 | .043 | .099 | .075 |
| 4 REFLECTIVE SPACES<br>2 aluminum foils<br>1 paper sheet . . . 3/8" apart | .105 | 9.53 | .081 | .042 | 24.01 | .035 | .037 | .068 | .056 |
| 5 REFLECTIVE SPACES<br>3 aluminum foils<br>1 paper sheet . . . 1" apart | .081 | 12.29 | .066 | .034 | 29.40 | .031 | .030 | .051 | .044 |
| 6 REFLECTIVE SPACES<br>3 aluminum foils<br>2 paper sheets . . 1" apart | .067 | 14.81 | .056 | .032 | 30.80 | .030 | .026 | .042 | .037 |


**For a FREE COPY of "The Thermal Insulating Value of Air Spaces" and samples of a multiple aluminum insulation which automatically subdivides building spaces use the coupon below.**

INFRA INSULATION, Inc., 525 B'way.
New York, N. Y., Dept. V-10
Please send "Research Paper No. 32."

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FIRM

ADDRESS

## WASHINGTON OVERTONES (*Continued from page 6*)

• Witnesses desiring to be heard on tax matters are being invited to contact the Committees.

• Meanwhile, mid-year review by Bureau of the Budget offers little encouragement for tax cuts. Bureau forecast is that surplus for fiscal 1957 will not exceed $700 million. For fiscal 1956—when actual surplus was $1.8 billion—neither political party considered the figure high enough to permit a tax cut.

• **Yet taxes can be cut!** On September 1, two reductions took effect. One increased the exemption on transportation of persons from 35 to 61 cents; the other raised to 90 cents (from 50) the level at which amusement taxes are assessed. The two cuts leave $66 million in taxpayer pockets.

• If personal income tax exemptions were raised to $800 from $600, **loss to Treasury would be $4.5 billion!** Neither political party has yet figured out how to cut expenses enough to permit such a cut.

• With Washington inconsistencies a source of changing wonder, it is reassuring to find many Capital City doings so "solid". Examples:

• **National Bureau of Standards** has developed a hand computer for rapidly calculating water content of gases. Principal use is to measure water content of aviation oxygen, rocket fuels and fire-extinguishing gases. Industrial applications: **determining moisture characteristics of refrigerating systems,** and control of moisture in inert gases.

• **Federal Power Commission** issues 1955 supplement to its publication "Steam-Electrical Plant Construction Cost and Annual Production Expenses, 1938-1947" (FPC S-123) $1.50 per copy, Federal Power Commission, Washington 25, D.C.

• **Office of Defense Mobilization** expects to divert approximately 40,000,000 pounds of nickel from the national stockpile to civilian use during first six months of 1957; expects growing capacity of aluminum to meet defense and civilian requirements without stockpiling; expects to **continue buying copper** for defense needs and stockpile.

• **General Services Administration** is about to change the name of its Emergency Procurement Service (EPS) to the Defense Materials Service. Change from EPS is recommended because "it is not an emergency program and procurement is not its sole function".

• **Office of Defense Mobilization** scheduled a mid-September hearing to consider whether there is a need for **further expansion of basic and finished steel capacity.** Requests for rapid tax amortization of facilities costing $842 have been filed with ODM.

• **Business and Defense Services Administration** reports a marked increase in the volume of requests for priorities assistance in obtaining scarce materials for defense production. Step-up reflects increasing shortages of steel shapes and other in-demand products. BDSA has limited aid to direct defense contractors and a few specific defense supporting contracts. Granting other requests, BDSA indicates, would virtually precipitate demand for restoration of a Controlled Materials system.

• **Census Bureau** predicts minimum annual **average growth of 700,000 in the number of households** between now and 1975. (lots of air conditioners, bath tubs, etc.).

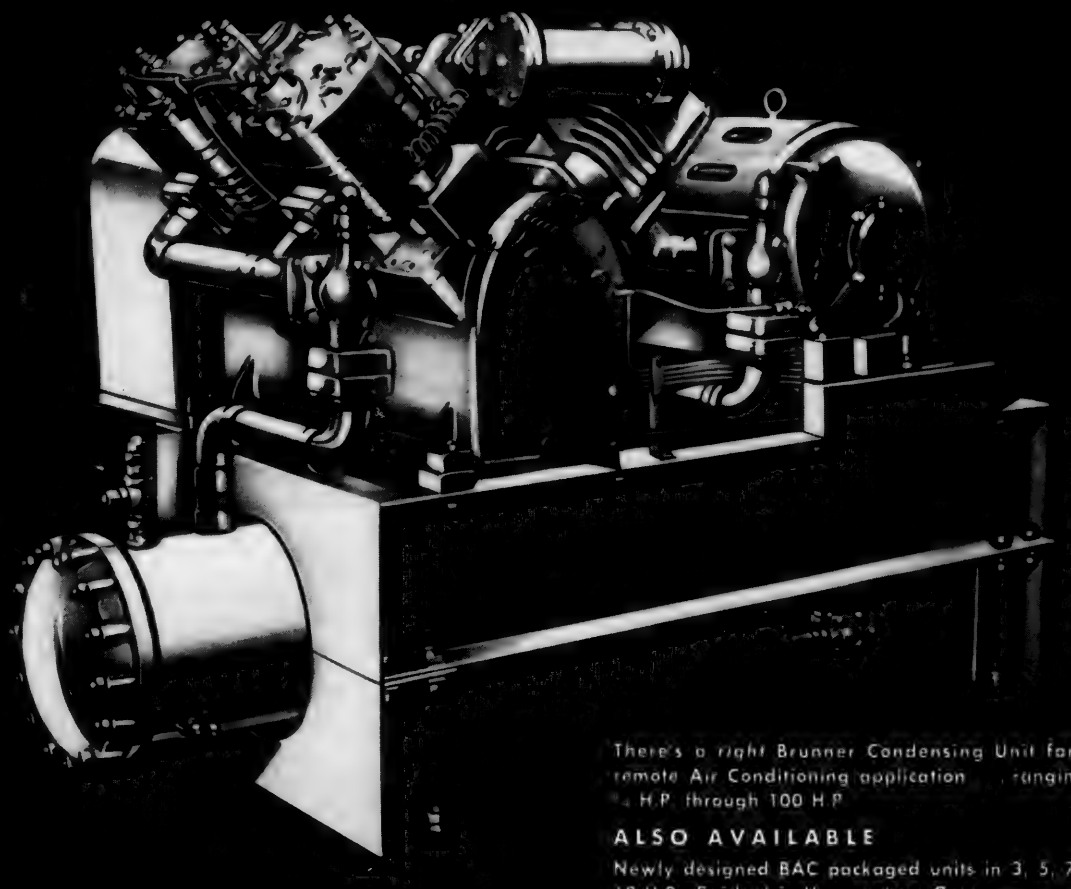
• **Commerce Department** Census of Manufactures for 1954 reports value added by manufacture in the refrigeration machinery industry totaled $1,006 million—**an increase of 71%** over $588 million in 1947. New capital expenditures by the industry rise 134% from $46 million in 1947 to $108 millions in 1954. Preliminary report for sale at 10 cents per copy from Census Bureau, Washington 25, D.C. and Commerce Department field offices. (Standard Industrial Classification Code 3585).

It was in 1906 that the first *Brunner-engineered* product appeared.

PROVEN QUALITY
50th Anniversary
BRUNNER
SINCE 1906
DEPENDABLE

# TODAY... Brunner experience pays off in more sales for you...

provides the most complete line of Air Conditioning Condensing Units available from a single source!



There's a *right* Brunner Condensing Unit for every remote Air Conditioning application . . . ranging from ¾ H.P. through 100 H.P.

**ALSO AVAILABLE**

Newly designed BAC packaged units in 3, 5, 7½ and 10 H.P. finished in Hammertone Green

# BRIEFLY STATED

• **Minneapolis-Honeywell Regulator Co.** is preparing to enter the electronic air cleaning field. Manufacturing operations will be at the company's Wabash, Ind., plant and marketing will start early in 1957. The company will work in cooperation with **Trion, Inc.,** and the two companies have entered a licensing agreement for the exchange of research and engineering information.

• Three executive changes in home office personnel were announced by American Air Filter Co., Inc. **Robert W. Nelson,** company vice-president, has been named director of the new administrative central staff. **John Hellstrom,** vice president, acquires the administration of the American Air Div. **James W. May** has been appointed director of technical training.

• **Harold V. Clyde** has joined the field organization of the Sporlan Valve Co., St. Louis, Mo. He will operate from the company's new Cleveland office and will service the Cleveland-Pittsburgh areas.

• **Mansur Storrs** has been appointed sales representative by James P. Marsh Corp. to service Maine, Vermont, New Hampshire, Rhode Island, Massachusetts and Connecticut. He will operate from the company's new New England office at 27 Temple St., Quincy 69, Mass.

• One-day fall and winter merchandising meetings are to be held in 21 major cities by **Airtemp Div.,** Chrysler Corp., to promote the company's low-cost home air conditioning systems.

• **William D. Graham, Jr.,** manager of the sales office of The Trane Co. in Greensboro, S. C., has been promoted and transferred to the home office in La Crosse, Wis., for a specialized assignment. **E. A. Stroupe, Jr.,** is the new manager of the Greensboro office.

• **The Interstate Air Conditioning Co.,** Sioux City, Iowa, has been appointed distributor of Dravo heating equipment for a territory which includes 47 counties in South Dakota and 10 in Iowa.

• A 60,000 sq ft expansion of the **Famco, Inc.,** plant has been announced by American Air Filter Co., Inc. Occupancy in the new addition is expected in May 1957. Famco produces glass fiber products.

• Penn Controls, Inc., Goshen, Ind., has added four new sales engineers to its staff. **Francis Halloran, Howard Costello, Jr.,** and **William Marshall** will specialize in trade service contract work on the East Coast, working respectively from the Boston, North Bergen, N. J., and Philadelphia offices. **Harold Swatman** will serve as sales engineer for the southern part of Texas.

• **Walther H. Feldman,** executive vice president of Worthington Corp., was elected a member of the Board of Directors. This increases the number to fourteen members.

• **National-U. S. Radiator Corp.** has moved its Washington, D. C., sales office and warehouse from 4034 Georgia Ave., N. W., to 6310 Chillum Place, N. W. The new headquarters contain about 4000 sq ft of floor space.

• **Miller & Chitty Co.** has been named manufacturers' representative by the Cleaver-Brooks Co. for counties in Northern New Jersey and Staten Island.

• **Frank J. Nunlist** has been appointed executive vice president of Mueller Climatrol. H. P. Mueller, Jr., succeeds Mr. Nunlist as vice president in charge of sales.

• **Felix J. Commagere,** Atlanta, Ga., was appointed distributor for Dravo heating equipment for almost the entire state of Georgia.

• **John H. Shreve** has been appointed vice president in charge of sales for the J. A. Zurn Mfg. Div., Zurn Industries, Inc. He was formerly managing director of Canadian Zurn Engineering, Ltd.

• **Douglas W. Bell,** of Bell Plumbing and Heating Co., Denver, Colo., was appointed a member of the Board of Directors of the Better Heating—Cooling Council. There are now eleven members on this board. **W. A. Burbine,** director of heating sales, Crane Co., was named to fill the unexpired term of the late George L. Erwin, Jr., who died in a plane crash in May.

• **Will J. Chappell** has joined the headquarters staff of Bryant Oil Product Sales, Indianapolis, Ind., as oil equipment sales manager.

• Mueller Brass Co., Port Huron, Mich., has appointed **E. L. Treppa,** formerly sales representative at the Chicago office, district manager of their New England territory with offices in Cambridge, Mass. **Vincent A. Bower,** a sales representative with the Detroit office, is now district manager of the Dallas, Texas, territory. **George I. Duddy,** formerly sales representative in Chicago, is now district manager of the New Orleans sales territory. **Richard C. Haenke** has been assigned to the Detroit office as sales representative and **Milton W. Gkekas** has been assigned to the Chicago office as sales representative.

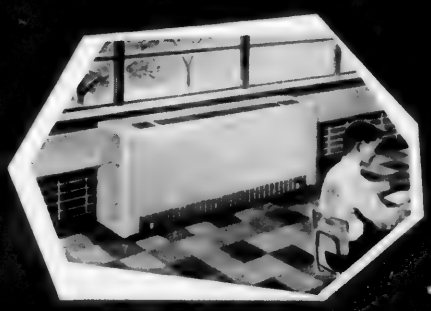
• Allis-Chalmers Mfg. Co. has named the **Carns-Hoaglund Sales Co.** of Phoenix, Arizona, a distributor to serve the air conditioning field in that city.

• **A. L. Hospers** has been appointed South-Southwest regional sales manager for Unarco Air Conditioning Products, National-U. S. Radiator Corp., and he will make his headquarters in Atlanta, Ga.

• Westinghouse Electric Corp. has made two appointments for its Sturtevant Division. **Charles V. Porter,** formerly sales engineer in the Boston office, has been named Boston district manager. **Anthony J. Pandiscio,** formerly sales engineer in the Des Moines office, has been advanced to Southwestern regional manager.

(*Continued on page* 12)

# look beyond the product



...SPECIFY

Nesbitt

## BRIEFLY STATED

(*Continued from page* 10)

• The appointment of **Dr. Philip P. Anderson** as director of development in absorption refrigeration has been announced by Carrier Corporation's central research and development division. He will be responsible for the absorption refrigeration program now underway in the division.

• The Dallas-Fort Worth Chapter of the Texas Association of Consulting Engineers has elected as its third president **Leo Landauer** of the firm of Landauer and Shafer. Thirteen member firms form the chapter and are responsible for the design and installation of air conditioning, heating, mechanical, and electrical systems in buildings.

• Orr & Sembower, Inc., Reading, Pa., has added the following sales representatives: **General Equipment Sales, Inc.,** El Paso, Tex.; **Albert F. LaReau,** New Windsor, N. Y.; **Thermal Engineering Co.,** Salt Lake City, Utah; and **Richardson Equipment Co.,** Boise, Idaho.

• The summer meeting of the Fuel Oil and Water Heater Manufacturers' Association was held at Pocono Manor, Pa. **R. F. Hull** of General Fittings Company was installed as president of the organization for the coming year.

• The appointment of **M. Everett Barnard** as manager of Carrier Corporation's unit heater department has been announced by the Allied Products Division. The new manager has been a member of the unit heater department since 1929 and sales manager since 1954.

• Announcement has been made that the **2nd Southwest Heating & Air Conditioning Exposition** will be held in Dallas, Texas, February 1 to 5, 1960. As in the case of the first exposition in 1950, it will be under the auspices of the American Society of Heating and Air-Conditioning Engineers whose 66th annual meeting will be held in Dallas at the same time.

• **H. H. Kieckhefer** has been appointed sales manager of the Wheelco Instruments Div., Barber-Colman Co., Rockford, Ill. For the past several years, Mr. Kieckhefer has been assistant sales manager.

• The appointment of **Louis G. Shenk, Jr.,** as manager of boiler and radiator products has been announced by Plumbing and Heating Div., of American Radiator & Standard Sanitary Corp., New York, N. Y.

• A direct-factory branch for heating and power equipment sales and service has been opened by York-Shipley, Inc., at 1519 New York Ave., N. E., Washington, D. C. **Frank Holland** is resident manager.

• **Robert C. Smith,** assistant treasurer of the Chase Brass & Copper Co., a subsidiary of Kennecott Copper Corp., is now treasurer of the company.

• **Robert M. Hatfield,** vice president of Combustion Engineering, Inc., has been appointed general sales manager of the company. **Frank M. Bader,** now an assistant general sales manager in New York will succeed Mr. Hatfield as manager of the Western Division in Los Angeles.

• New appointments were announced by Mark E. Mooney, vice-president of Typhoon Air Conditioning Co., Division of Hupp Corp. **Roy Scantlebury,** export manager of Typhoon Air Conditioning Co., was elected vice president of the newly formed Hupp International. **C. A. Comstock** was named Typhoon district sales manager for Florida. **Les Brosell** was appointed Typhoon district manager of the West Coast. With headquarters in Los Angeles, he will cover California, Arizona and Nevada.

• **James P. Hertz,** a graduate mechanical engineer, has been added to the Chicago office of Young Radiator Co., 205 West Wacker Drive, Chicago, Ill.

• Brunner Mfg. Co., Utica, N. Y., announces the appointment of **Philip E. Bracht** as a district sales engineer in the greater Chicago area.

• The Pacific Steel Boiler Division of National-U. S. Radiator Corp., Johnstown, Pa., announces that **R. B. Sweet & Associates,** Abington, Pa., has been appointed to represent the division in Southern New Jersey and Delaware.

• **Melvin H. Bird** has been appointed manager of the recently opened Sioux Falls, S. D., branch office of the Powers Regulator Co., Skokie, Ill. **Ralph Schoverling,** formerly with the company's Washington office, has been moved to the Baltimore office to head contract operations.

• **J. M. Gleason,** sales manager for the Williams Division of Eureka Williams Corp., has been elected to the Board of Directors of the Oil-Heat Institute of America, Inc.

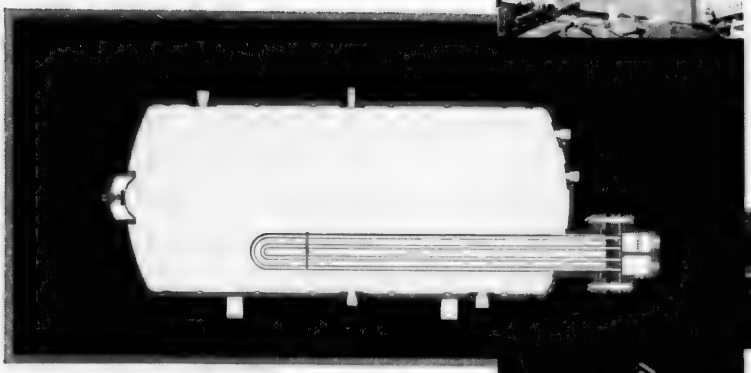
• **Millard A. Hammond** has been advanced to manager of Welding Fitting Sales of the Babcock & Wilcox Co., Tubular Products Div. He will be responsible for product sales in the 15 district sales offices throughout the United States and four foreign sales representatives of the division. He will be located at the Milwaukee plant.

• **J. H. Seastrom** has been appointed sales manager of the Plumbing Products Division of Cutler Metal Products Co., Camden, N. J.

• **Rex Falkner** assumes the position of Southeastern District Manager, and Norman D. Partridge succeeds Falkner as Midwestern District Manager of William Wallace Co.

• **Ralph R. Ryan** has been named sales representative of the Detroit District of the Tubular Products Div., The Babcock & Wilcox Co. He will serve under the direction of Frederick Foglesong, manager of the district.

**Dallas: Republic National Bank Building.** *Architects:* Harrison & Abramovitz; Gill & Harrell. *General Contractor:* J. W. Bateson Company, Inc. *Consulting Engineers:* Jaros, Baum & Bolles. *Mech. Contractor:* Farwell Company, Inc.



**Denver: Mile High Center.** *Architects:* I. M. Pei and Associates. *Associated Architect:* G. Meredith Musick. *Contractor:* George A. Fuller Company. *Consulting Engineers:* Jaros, Baum & Bolles. *Mechanical Contractor:* Kerby Saunders, Inc.

**New York: Lever House.** *Architects:* Skidmore, Owings & Merrill. *Contractor:* George A. Fuller Company. *Consulting Engineers:* Jaros, Baum & Bolles. *Mechanical Contractor:* Kerby Saunders, Inc. *Plumbing Contractor:* Gillman-Rous-Pesce Corp.

## FOR TROUBLE-FREE, GUARANTEED PERFORMANCE

## THEY SPECIFIED P-K *Copper-Lined* HEATERS

These three famous new buildings are at different points of the compass . . . yet they have one thing in common. When it came time to specify storage heaters, they selected P-K. And though they're far separated in miles, these P-K copper-lined heater installations aren't as isolated as they look. A list of famous buildings all over the country using P-K copper-lined heaters is an honor roll of American business.

Why are P-K copper-lined heaters specified for America's finest buildings? For one thing, experienced engineers know the value of having one supplier who carefully makes and assembles (and is responsible for) every component of the heater.

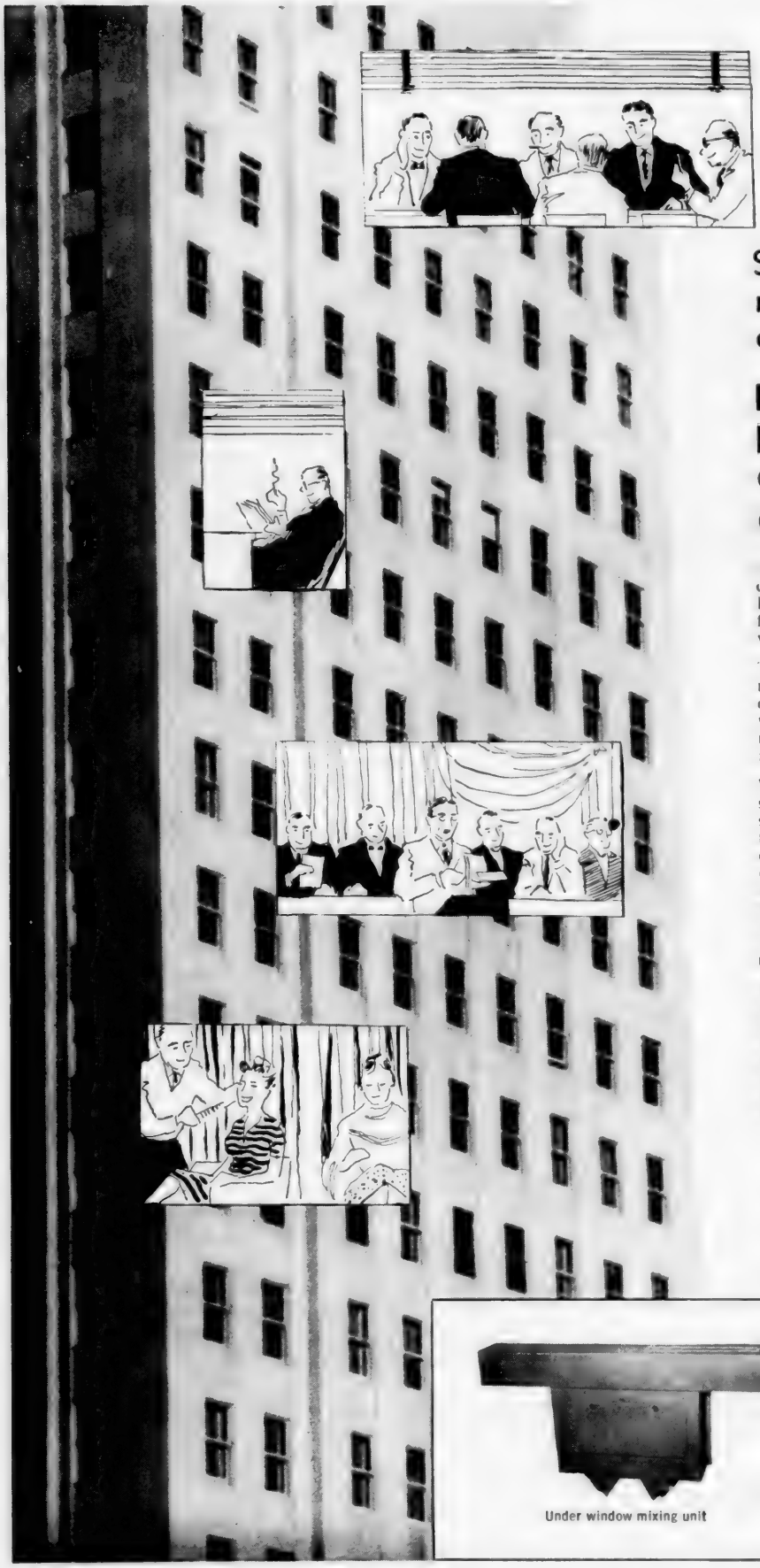
But more important, engineers know that when it comes to vital points of construction, P-K is miles ahead. For example, P-K copper-lined heaters have rolled joints every 12 inches around the full circumference, to allow for longitudinal expansion . . . heavy flanged copper silicon couplings, welded to both the shell and the lining . . . and a special P-K vacuum breaker to protect the lining from sudden pressure fluctuation. Separate hydrostatic and pneumatic tests are made to guarantee leak-proof linings.

There are other points, too, not found in so-called "economy" heaters, that should be specified for any heater you buy. All these critical construction features have been detailed in a fabricating procedure file which we have prepared on copper-lined heaters. We think you will find it helpful. Write today for P-K file 183.

**The Patterson-Kelley Company, 1000 Burson Street, East Stroudsburg, Pa.** 2577

# PATTERSON KELLEY

storage water heaters • instantaneous heaters • converters • fuel oil heaters • freon chillers and condensers



Select the temperature room by room... it stays constant automatically

# Buensod-Stacey DUAL DUCT air mixing units are the reason

The mixing unit is the heart of the dual duct method of air conditioning. The Buensod-Stacey dual duct mixing unit differs from all others in its self-contained volume control.

This control is completely automatic and requires no outside connections or source of power. It will maintain the volume of warm and cool air entering a given room regardless of variations in pressure at the inlet of the unit.

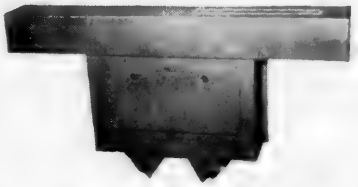
When thermostatically controlled, Buensod-Stacey air mixing units maintain steady room conditions even when outside temperatures vary as much as 40° in one day! You can heat one room and cool the one next to it . . . allow 100 people in one room to be as comfortable as the two in the room next door (just as the varying spaces illustrated at the left are conditioned by *one* system). And the system needs no costly seasonal changeover.

Buensod-Stacey dual duct units contain no coils, fans, filters, electric motors or water piping. This means there is virtually no service or maintenance for the units – no possibility of leaks or corrosion in scattered areas throughout the building. Buensod-Stacey equipment is available for large or small, existing or new buildings.

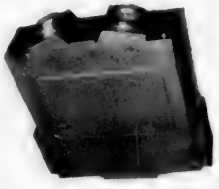
*For full information write:*

BUENSOD-STACEY
INCORPORATED

45 West 18th Street • New York 11, N. Y.



Under window mixing unit



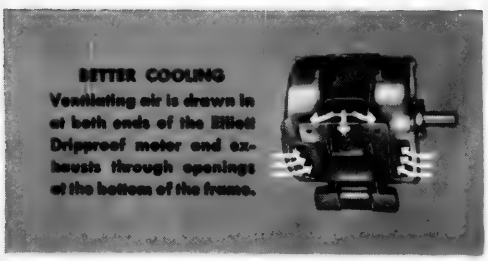
Air mixing unit for overhead installation

# Inside and Outside . . . entirely new

DRIPPROOF TYPE FRAMES 182-326U

## the NEW Elliott C-W Dripproof Motor

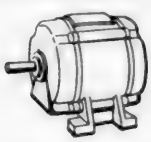
## BALANCED DESIGN assures dependable performance


BETTER COOLING
Ventilating air is drawn in at both ends of the Elliott Dripproof motor and exhausts through openings at the bottom of the frame.

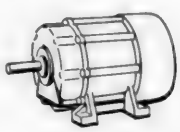
The *balanced* design of the new Elliott C-W type N motors provides the *best* in mechanical protection, the *best* in insulation, the *best* in bearings, the *best* in rigid construction. These motors produce more horsepower per pound, require less space, less maintenance, have longer service life. Every rotor is dynamically balanced. Rigid cast frames assure correct alignment, resist corrosion and mechanical abuse. Highly effective cooling eliminates troublesome hot spots.

The design illustrated above is dripproof—and virtually splash-proof as well. Yet ingenious design has provided ample passages for cooling air. Other types of enclosures providing even greater protection are available for service where conditions are extremely severe.

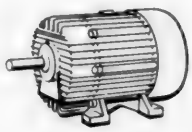
OTHER C-W TYPE N MOTOR ENCLOSURES



Totally-enclosed non-ventilated



Totally-enclosed, fan-cooled Frames 256 U and smaller



Totally-enclosed, fan-cooled Frames 284U-326U

**ELLIOTT Company**

CROCKER-WHEELER DIVISION

**For complete details, send for new booklet. *WRITE* Elliott Company, Crocker-Wheeler Division, Jeannette, Pa.**

W6-5

Air conditioned comfort in the

# Lutheran Brotherhood

new home office building in Minneapolis

is regulated by a **POWERS**

thermostatic control system

**Advanced thinking in facilities, architectural design and superior mechanical equipment is embodied in this life insurance society's new building. It is one of the first in the Twin Cities to have a curtain wall and complete modern air conditioning incorporated into the original design of the building.**

PERKINS & WILL
Architects

E. R. GRITSCHKE & ASSOCIATES
Mechanical Engineers

KRAUS-ANDERSON, INC.
General Contractors

MIDWEST SHEET METAL WORKS
Air Conditioning Contractors

REUBEN L. ANDERSON-CHERNE, Inc.
Piping Contractors

Year 'round air conditioning is provided by separate perimeter and interior systems. In the perimeter areas, air conditioning units are served by a high pressure conduit system. Thus, occupants in each individual space may select the temperature desired by adjusting the Powers thermostat inside the unit.

Interior zones are supplied with conditioned air from ceiling diffusers. Here, too, Powers controls automatically adjust temperature to the requirements of occupancy and outside weather.

Humidity control is provided by a "reheat system." Air is chilled to remove excessive moisture. It is then warmed to the comfort condition called for by the Powers master zone thermostat which operates control valve on zone steam reheat coil.

Air infiltration through windows and curtain walls is prevented by Powers static pressure controllers. They automatically maintain a fixed differential between indoor and outdoor air pressures.

**Are You Planning a New Building** or modernizing an old one? If so consider the advantages of a Powers Quality system of temperature control. They have been time-proved dependable in thousands of buildings since 1891. For utmost comfort and lowest upkeep cost . . . specify and install Powers air conditioning control.

*For further information contact our nearest office*

**THE POWERS REGULATOR COMPANY**

**SKOKIE, ILLINOIS** | *Offices in Chief Cities in U.S.A., Canada and Mexico*

*65 Years of Automatic Temperature and Humidity Control*

POWERS CONTROL

*Symbol of Economy and Quality Control*

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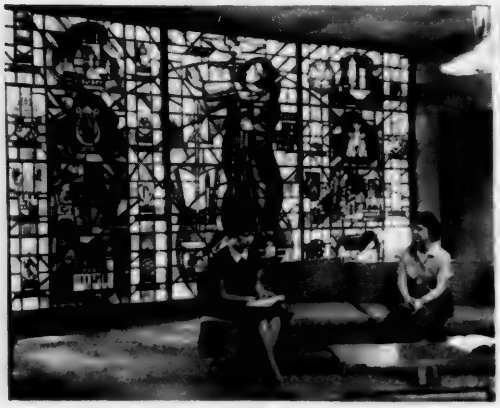
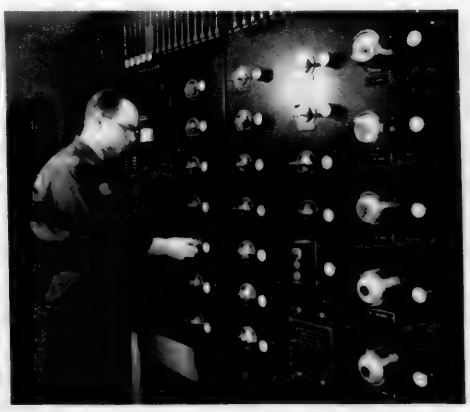


**Efficiency combined with architectural beauty** is the keynote in this colorful building. It has a curtain wall of blue-green porcelain enameled steel; an auditorium seating 266 people; the Martin Luther Library; sunken garden terrace and fresh air intake louvers above, which are well integrated into the building design. Photo below shows zone temperature indicator also the central control panel of the POWERS AIR CONDITIONING CONTROL SYSTEM.



# KEEP IT CLEAN...

## by Phil Tration

Dry Panel Ventilation Filter

The uses for Dollinger Filters are truly "elephantine" . . . any liquid, gas, or air can be efficiently and economically handled by them. For heavy duty ventilation work the Dry Panel Filter illustrated at the right is extremely efficient.

The Dollinger Dry Panel Filter operates with any filtering material that comes in sheet form and can be crimped. Preformed filtering elements are available for quick and easy replacement when necessary.

Whatever your filtering problems, wherever you are, there's a Dollinger representative ready to help you solve it . . . write today and ask for ventilating filter catalogs, Dollinger Corporation, 15 Centre Park, Rochester 3, N. Y.

**DOLLINGER**
**STAYNEW FILTERS**

LIQUID FILTERS • PIPE LINE FILTERS • INTAKE FILTERS • HYDRAULIC FILTERS
ELECTROSTATIC FILTERS • DRY PANEL FILTERS • SPECIAL DESIGN FILTERS
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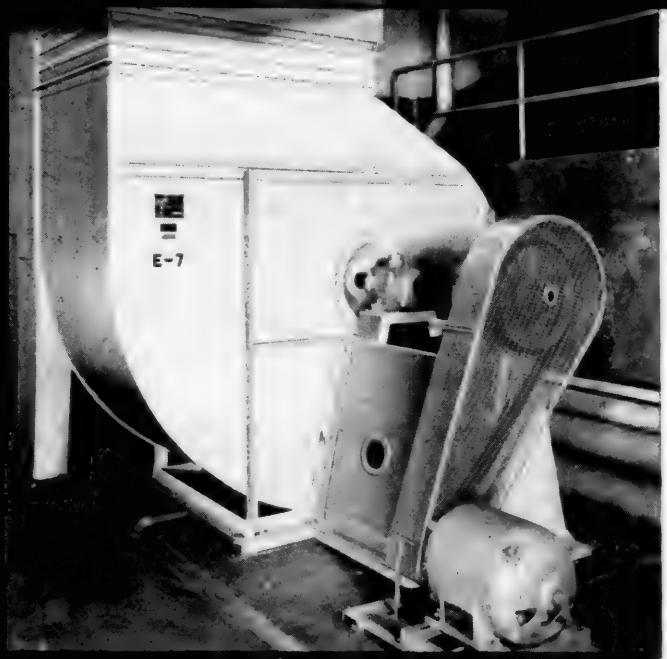
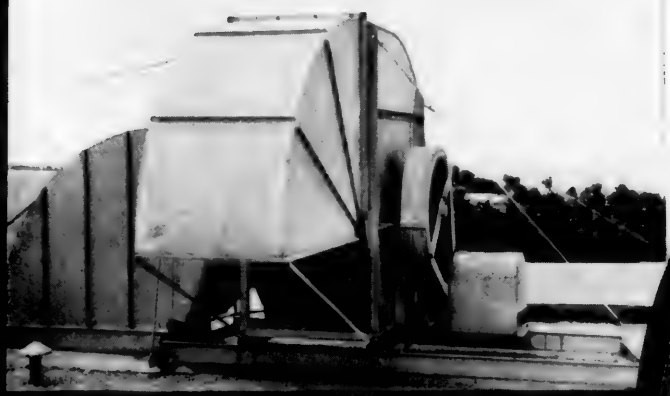
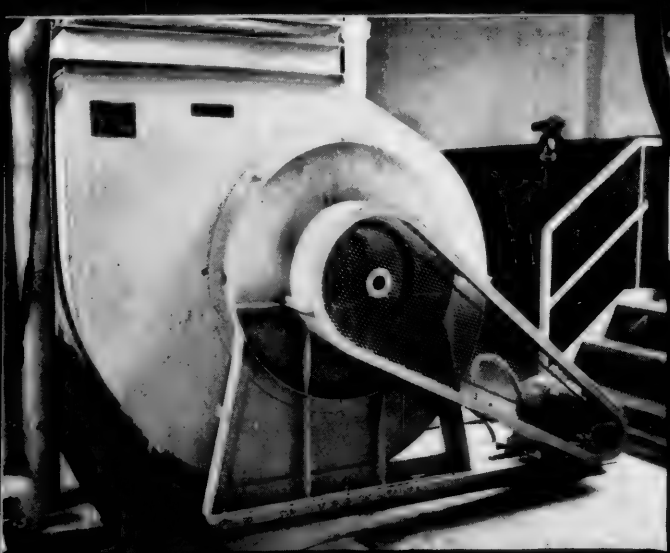


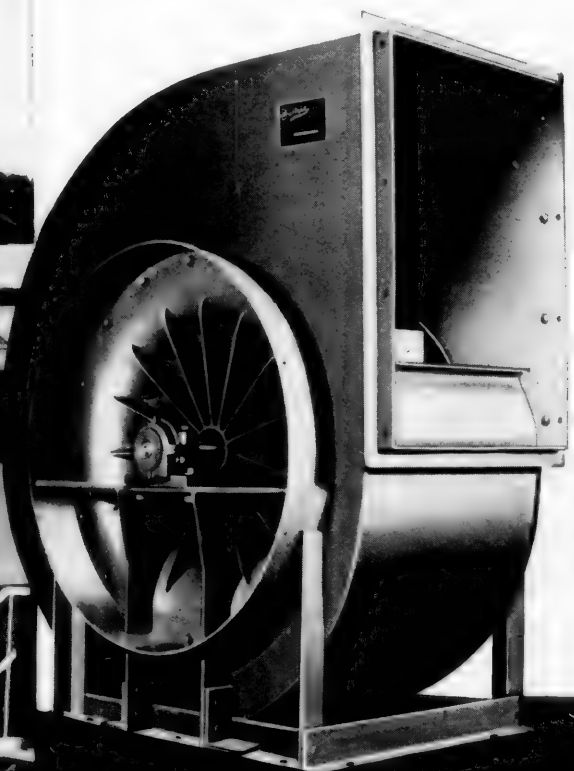

# WHY "BUFFALO" BL FANS ARE USED FOR SO MANY OF THE BIGGEST JOBS

Not because of first cost, certainly. We build into "Buffalo" Type BL Limit-Load® Ventilating Fans the characteristics we know they must have to give the best possible service. This refusal to short-cut quality has occasionally cost us some business, but has made "Buffalo" *the* choice for reliability and performance on the job.

Thus, engineers and contractors appreciate the "Q" Factor* built into these fans. They know the smoothly curved inlet collar with "Buffalo" inlet guide vanes reduces entry turbulence and simplifies the duct connection. They know how smoothly and efficiently the backward-curve-blade wheel and properly proportioned housing handle air. They know that performance is stable from free delivery to shutoff. In short, they know they've done the best by the customer in specifying "Buffalo". Bulletin F-101 gives all details — write for your copy and see why "Buffalo" is in so many of the country's finest and largest installations.







"Buffalo" Type BL Limit-Load® Ventilating Fan. Capacities to 500,000 cfm.

# AIRCOUSTAT* sound traps layout for controlling

AIRCOUSTAT SILENCES ALL FREQUENCIES IN THE AUDIO-FREQUENCY RANGE
Resonators hold low-frequency sounds
Periodic internal structure dampens middle-frequency noise
Sound-absorbent materials suppress high frequencies

# simplify design and air conditioning noise

## THIS 5-FT. AIRCOUSTAT REPLACES 80 FEET OF ORDINARY DUCT LINING

*AIRCOUSTAT saves you time on the job because it's pre-engineered . . . and fits acoustically if it fits geometrically. AIRCOUSTAT is quick and easy to install . . . no special tools are required.*

### Most Efficient Solution

AIRCOUSTAT's power to deaden sound is unmatched by other sound control methods devised for air conditioning systems. Acoustical performance is *guaranteed*. Efficiency is more than 13 times that of ordinary lining. And AIRCOUSTAT provides a lower flow resistance and less pressure drop than other sound control methods.

AIRCOUSTAT suppresses sound in low-velocity air conditioning systems . . . will silence an entire system or selected outlets. AIRCOUSTAT units fit any size of duct within the range of unit sizes . . . adapt themselves to any shape of duct.

### Cost You 50% Less

AIRCOUSTAT units cost you as much as 50% less than ordinary duct lining . . . with savings in time and labor costs. AIRCOUSTAT is quick and easy to install . . . no special tools are required. You can ship ducts nested together and store them outside on the job site.

### Apply Anywhere

AIRCOUSTAT eliminates noise in a wide range of applications: general and private offices, conference rooms, sleeping quarters, and recording studios.

### Born of the Jet Age

Koppers' amazing new AIRCOUSTAT is the product of years of experience in designing sound control installations for aviation and other industries. Jet engine housings, machine enclosures, sound barriers and traps, sound-proof foremen's offices—these are only a few of the many sound control devices created by Koppers Industrial Sound Control engineers. Koppers has put this engineering "know-how" to work silencing air conditioning noises more effectively . . . more economically than was ever before possible . . . saving you time and costs.

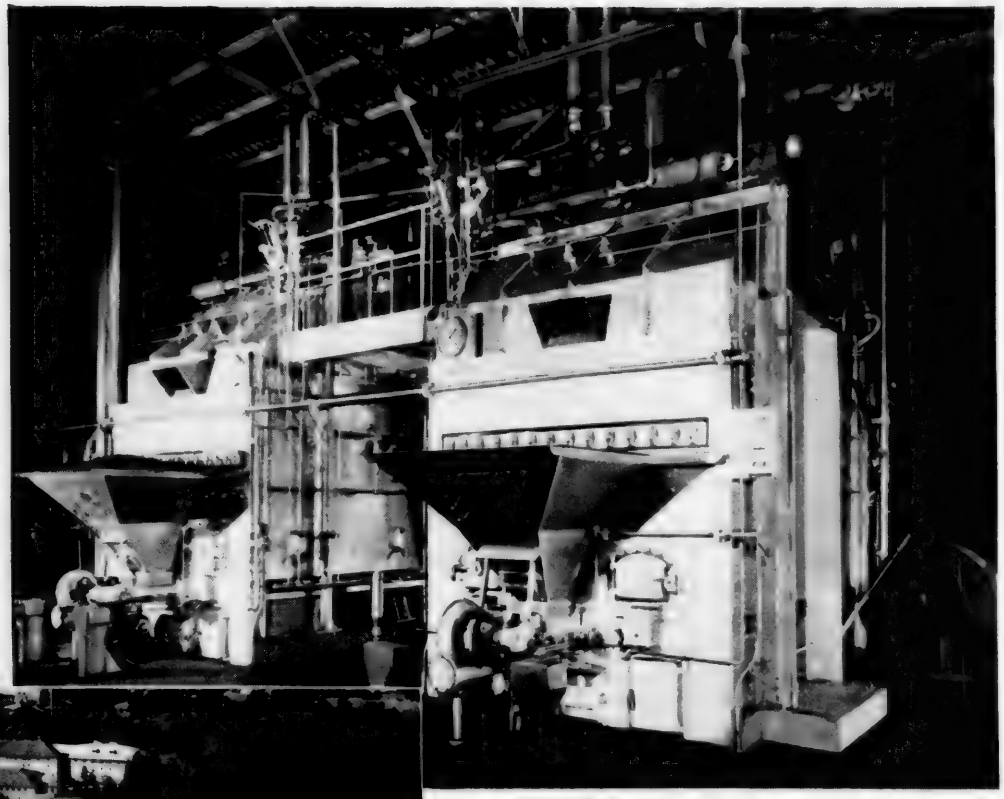
For more details, write to KOPPERS COMPANY, INC., Industrial Sound Control Dept., 6310 Scott Street, Baltimore 3, Maryland.

*Koppers Trademark

KOPPERS

**INDUSTRIAL SOUND CONTROL**

*Engineered* Products Sold with *Service*



Each of the stoker-fired B&W Type FF Integral-Furnace Boilers at Pinehurst is designed to supply 17,000 lb of steam per hr. Wiley & Wilson of Richmond, Va., are the Consulting Engineers.

# STEAM COSTS ⅓ LESS AT PINEHURST

## Two B&W Boilers Help Cut Fuel and Other Plant Costs at North Carolina Resort

The need for a dependable steam supply that is also efficient and economical led Pinehurst, Inc. to install two coal-fired B&W FF Boilers in re-vamping its central steam plant. A famous winter resort, Pinehurst can't take chances with its steam supply. It must have as much steam as it needs, when and where it is needed. These new boilers replaced five older units to supply steam for all purposes to ten buildings, three of them hotels. In an emergency they provide steam for electric power generation.

By this modernization of its boiler plant, Pinehurst, Inc. gets more steam from less coal and at less cost. And, with automatic boiler controls, simplified coal- and ash-handling and substantially reduced maintenance, other costs have also been shaved.

If you use steam for power, processing or heating, be sure that your steam dollar is giving you full value. If you think it isn't, B&W will be glad to put 90 years of steam generation experience at your disposal, to help you modernize or expand your steam plant for important, long-term savings. Write, The Babcock & Wilcox Company, Boiler Division, 161 East 42nd Street, New York 17, N. Y.

**BABCOCK & WILCOX**

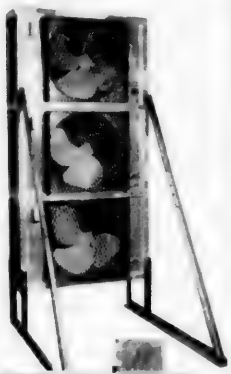
BOILER DIVISION

G-788

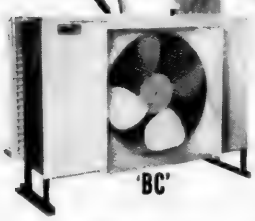
# BUSH ... a SINGLE SOURCE FOR *All* YOUR WATER-SAVER NEEDS

'CDT'

'IEC'



'PFC'



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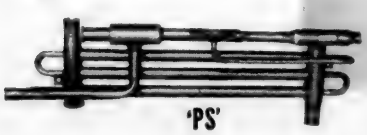


'PS'

Wherever water is scarce, expensive, or contains excessive impurities . . . or wherever disposal facilities are inadequate . . . a Bush water-saver can solve the problem. Whatever your need or preference in water-saving equipment, there's a Bush unit to meet it.

All Bush water-savers incorporate the most advanced engineering design . . . feature rugged, top quality construction.

For single-source simplicity, select BUSH. And for capable engineering or application assistance, call on the experienced Bush sales engineer in your area.

## 'CDT' COPPER DECK COOLING TOWERS

All copper decking cannot rust or rot. Sectional construction permits arrangement with blower fan or propeller fan . . . permits substitution of Inner-Fin coil for operation as evaporative condenser.

## 'PFC' PROPELLER-FAN CONDENSERS

Permit condensing of refrigerant *without use of water*. Two basic models, 2.2 Tons and 3.3 Tons, can be combined by mounting in banks to obtain any desired tonnage.

## 'IEC' INNER-FIN EVAP CONDENSERS

Inner-Fin coil construction, a *Bush exclusive*, permits compactness of construction impossible in other units. Can be operated DRY where conditions warrant. Can be arranged with blower fan or propeller fan . . . converted to cooling tower by substitution of copper decking for condenser coil.

## 'BC' BLOWER CONDENSERS

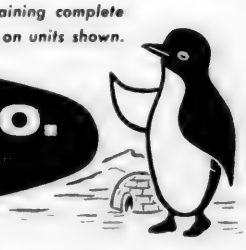
For *waterless* condensing. Available in capacities up to 20 Tons, units feature low noise level . . . *quiet* operation. Famed Inner-Fin coil construction, rugged all-steel cases with durable rust-resistant finish. Easy to install; available arranged with blower fan or propeller fan.

## 'PS' PRESSURE STABILIZERS

Automatically maintain satisfactory head pressure when air cooled condensers operate outside in low ambient temperatures.

*Request catalogs containing complete specifications on units shown.*

**BUSH MANUFACTURING CO.**



Dravo heater supplies warm air as needed in this southern plant.

# Dravo heaters provide economical solution to "chilly morning" problem in Texas

Early morning temperatures go below freezing during part of the year in Texas, but as the sun gets higher the thermometer quickly climbs to 75° and higher.

To maintain a constant heat level under these rapidly changing conditions, Oil Well Supply Division of United States Steel Corporation chose Dravo *Counterflo* heaters for their Garland, Texas plant and warehouse. Six 2,000,000 Btu per hour Dravo heaters provide instantaneous transfer of heat from combustion chamber to air stream. This eliminates lag in comfort heating during the chilly morning hours. A thermostat mounted in the return air stream cuts off the fan motor and fuel supply at a predetermined temperature, thus preventing heat-override.

Dravo *Counterflo* heaters are efficient and economical. They require minimum capital investment, minimum installation expenditure, provide low operating costs and there is no need for a full time operator.

Custom engineered Dravo heaters are designed to solve your particular heating problem and save you money at the same time. Why not write for complete information? Address—Dravo Corporation, Machinery Division, Dravo Building, Pittsburgh 22, Pa. Sales representatives in principal cities.

**DRAVO**

**CORPORATION**

Blast furnace blowers • boiler and power plants • bridge sub-structures • cab conditioners • docks and unloaders • dredging • fabricated piping foundations • gantry and floating cranes • gas and oil pumping stations • locks and dams • ore and coal bridges • process equipment • pumphouses and intakes • river sand and gravel • sintering plants • slopes, shafts, tunnels • space heaters • steel grating • towboats, barges, river transportation

SKIDMORE PUMPS — *set the pace in performance**

Featuring—mechanical shaft seal

dependable performance

quiet operation

# NEW BULLETIN NO. 21-B

**send for your copy**

Make sure you get all the advantages when you buy or specify heating pumps. The new SKIDMORE type CVS condensate pump offers the very last word in pump engineering—*Mechanical shaft seal . . . greater range of discharge pressures. Compact design . . . lightweight construction . . . quiet operation and dependable performance.*

**TYPE CVS**
**DUPLEX UNIT**

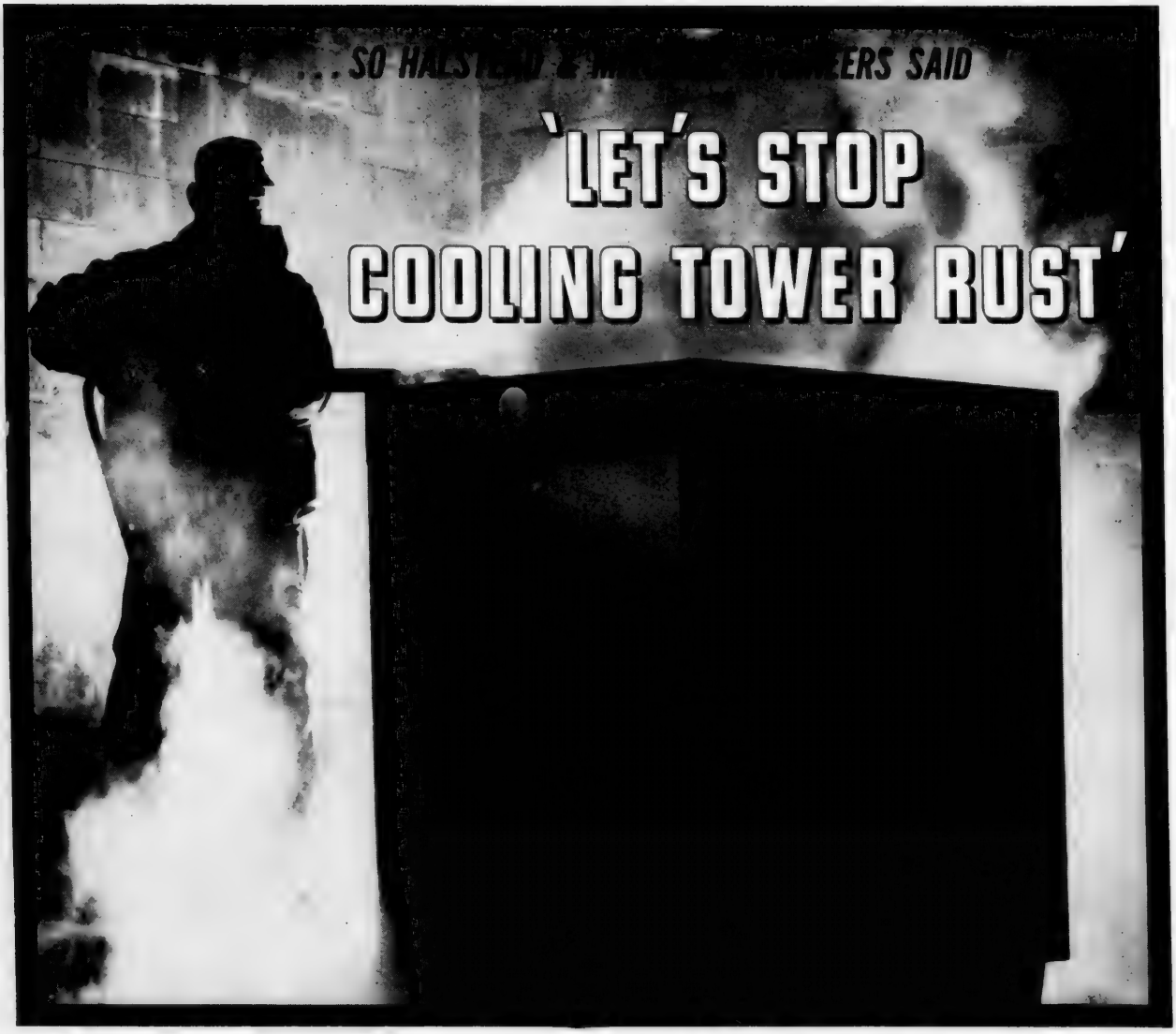
For heavy duty service specify a SKIDMORE CVS duplex unit. Above is shown pump with two floats and switches. Unit is also furnished with one float and mechanical automatic alternator to provide alternating operation of two pumps.

**TYPE CVS**
**SINGLE UNIT**

## *Here are the answers to— your Heating Pump Problems*

*SKIDMORE PUMPS have set a standard for performance and dependability since 1921

**...ORE CORPORATION**
ST. JOSEPH, MICHIGAN




The man shown above is using live steam to remove every vestige of dirt and scale prior to applying Halstead & Mitchell protections which withstand both rusting and *all* present day water treatments normally recommended for cooling towers and condensers. These unusual protections are used *only* on Halstead & Mitchell's Cooling Towers.

First protection is Vinsynite. Vinsynite works twice—it phosphates the metal, stopping rust dead in its tracks, and it forms the perfect adhesive base for paint coats to follow.

Vinyl Zinc is then applied, and vinyl paints have made their reputation because they are tough, flexible, inert and water resistant. Water vapor is locked out as the Vinyl Zinc locks to the underlying Vinsynite.

Third protection is chlorinated rubber, a paint which forms a thick film. Adequate film thickness is important when contact with water and high humidity is unrelenting, as in cooling tower service. Chlorinated rubber is also noted for its toughness and water resistance.

**Halstead & Mitchell protections are more than painted on.** They are hydraulically forced into every nook and cranny of every Halstead & Mitchell Cooling Tower so that no spot can ever be left unprotected as a starting point for rust. The combination of heavy film, vapor seal, toughness and tremendous adhesion offer protection against corrosion matched by no other manufacturer.

*Want Details on the Widest Selection in Cooling Towers?*

**COMMERCIAL · INDUSTRIAL · RESIDENTIAL · TAKE-APART · CENTRIFUGAL**

Write Halstead & Mitchell, Bessemer Bldg., Pittsburgh 22, Pa.
Or See Your Leading Wholesaler

HM
Halstead & Mitchell

**WOOD ROTTING, TOO, CAN BE STOPPED!** **We do more than praise the long life of wood used in our wetted decks—we are the only manufacturer who offers a 20-Year Guarantee on wetted deck wood against rotting or attack by fungus!**

# *Jenkins* designed for trouble-free performance... a

## STAINLESS STEEL "Y"

### to lower costs in a wider range of

## CORROSIVE SERVICES

For food and chemcial plants, and similar services, Jenkins Fig. 1335 "Y" Globe offers many advanced features that will lower operating costs and keep your processing lines trouble-free. The disc, packing, and gasket are tough, resilient Teflon. Tasteless and odorless, it eliminates problems of contamination.

The "Y" pattern permits full flow, nearly equal to that of a gate valve, and also provides the vapor-tight closure and the ease of disc renewal of a globe valve.

Fig. 1335 offers extra value by any test . . . *initial cost, operating efficiency, low maintenance.* You can convert this extra value into *extra savings* on your toughest corrosive services. Call your Jenkins Distributor, or write: Jenkins Bros., 100 Park Ave., New York 17.

Dupont TEFLON is a tough, "waxy", inert solid, tasteless and odorless, non-adhesive and frictionless.
TEFLON DISC
Teflon's high resilience constantly conforms disc to lapped seat for vapor-tight closure.
TEFLON PACKING
Packing is one-piece ring of Teflon, made extra wide and deep to provide lasting, dependable leak-proof seal.
TEFLON GASKET
Gasket is held securely in place by the tongue and groove body-bonnet joint, another leak-proof construction feature.
1
2
3
4

**FULL, FREE FLOW** through Fig. 1335 is nearly equal to flow through a gate valve.

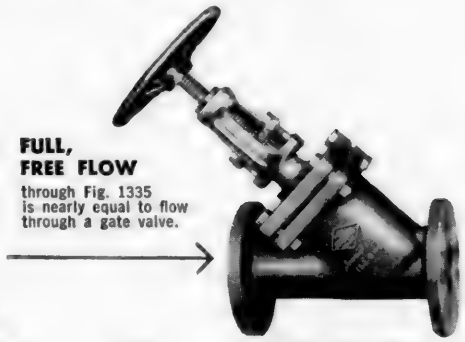


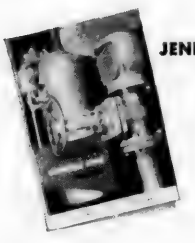
**Fig. 1335 "Y" GLOBE**
**150 lbs. O.W.G. at 500°F**
**230 lbs. O.W.G. at 100°F**
**Sizes 1" to 4"**

(1) **Packing Box**—Exceptionally deep and wide to hold optimum size packing.

(2) **Spindle**—Polished shank, long-operating threads, bevel shoulder for backseating.

(3) **Gland**—Two-piece for equalized pressure, tight seal.

(4) **Flanges**—Conform to M.S.S. Standard Practice S.P.42 Specifications.



**JENKINS STAINLESS STEEL VALVE BOOKLET** illustrates and describes wide range of Jenkins Globe, Gate, Check, and Y Valves, includes selection data, survey forms. Ask for Form 200-A.

JENKINS VALVES

LOOK FOR THE JENKINS DIAMOND

SINCE 1864 TRADE JENKINS MARK

Jenkins Bros.

# KEWANEE "CRUISING PASSES CRITICAL

■ In a hospital there can't be the slightest margin of error. Nowhere else is equipment required to pass such critical tests. Mr. Howard A. Palestine, Manager of Mid-Island Hospital, Bethpage, Long Island, puts it this way: "Like all hospitals, ours operates 24 hours a day, 7 days a week . . . and we do it with the help of such dependable equipment as Kewanee Boilers. It was the reputation which KEWANEE has built up over the years which prompted us to specify that this type of boiler system be used." Rated on nominal capacity, Kewanee Reserve Plus Rated Boilers with 50% extra built-in power, fill normal requirements in stride. Yet, they can be stepped up instantly to produce additional power needed for emergencies—for fluctuating loads. They provide for expansion too. Here you get "cruising speed" boiler operation with greater efficiency—lower fuel and maintenance costs . . . less stress and strain, plus constant protection against breakdowns and repairs. There's no necessity to operate at full speed all the time. In addition, "cruising speed" operation means you get much longer boiler life. So select Kewanee Reserve Plus Rated Boilers. You can be sure of dependable service, with savings in money too. KEWANEE BOILER DIVISION OF AMERICAN-STANDARD, 101 Franklin Street, Kewanee, Illinois.

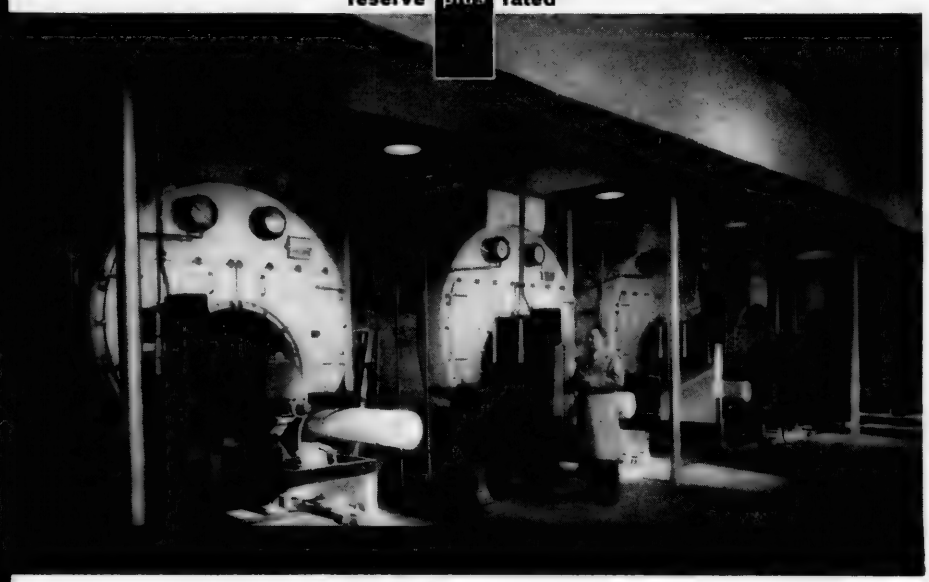
# *SPEED"* BOILER OPERATION TEST AT MID-ISLAND HOSPITAL

Reception room and admitting desk of Mid-Island Hospital.

The spotless kitchen where appetizing meals are prepared.

KEWANEE

reserve plus rated



Here are five Kewanee Boiler-Burner Units which provide 'round the clock dependable service at Mid-Island Hospital.

Mid-Island Hospital, Bethpage, Long Island, New York. Designed, engineered and constructed by Will N. Clurman Associates, New York, N.Y.

Architects: Gloster & Gloster, Rockville Center, New York.

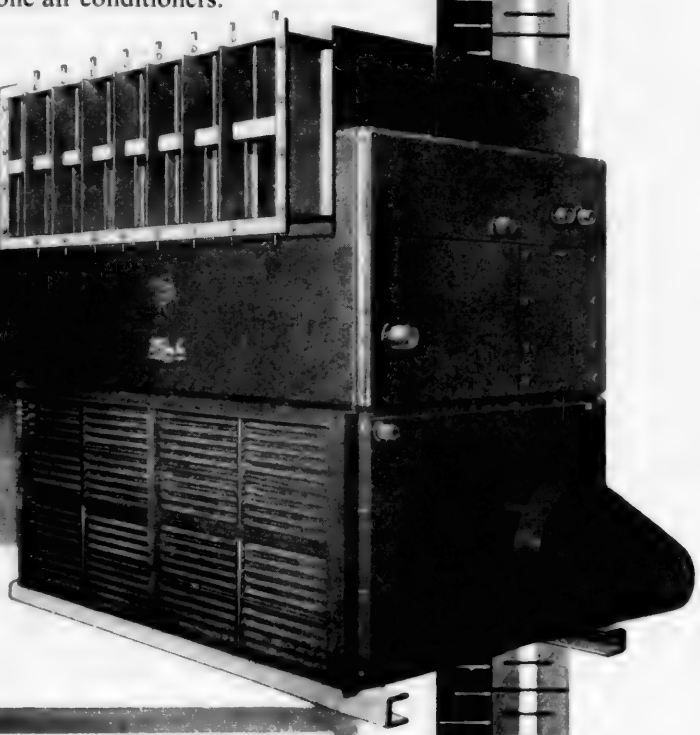
AMERICAN-Standard

KEWANEE BOILER DIVISION

**COOLING • HEATING • VENTILATING • HUMIDIFYING • DEHUMIDIFYING • FILTERING • ZONE CONTROL** • The McQuay Multi-Zone Air Conditioning Unit is designed for buildings where both heating and cooling are required at the same time. The unit is constructed to deliver to each zone, either filtered, cooled and dehumidified air; or filtered, heated and humidified air. By automatic control of the zone dampers a mixture of the cold and warm air is supplied to each zone at the required air temperature. Available in eight sizes in horizontal or vertical models with capacities from 1360 CFM to 21000 CFM. Each "MC" unit has a maximum number of zones—from six on the smallest size to 22 on the largest. A complete line of coils and accessories are available. Write for McQuay's new 12 page catalog, No. 550. It will give you a big assist in planning the installation of multi-zone air conditioners.

## McQUAY "MC"

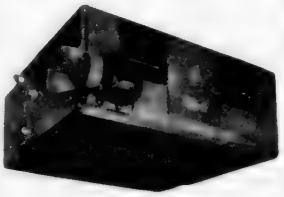
# HEATS AND OR COOLS



**SIMULTANEOUSLY**
**up to 22 zones from one Multi-Zone Unit**

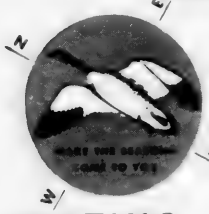
## McQUAY "AC" UNITS

Popular McQuay "AC" units, companions to the "MC" Units, provide heating, or cooling to commercial buildings where only one zone is required. Fourteen models for horizontal or vertical installation offer capacities ranging from 640 CFM to 21000 CFM. Write today for McQuay Catalog No. 505 to help you meet specifications for central air conditioner installations.



Horizontal "AC" Unit

**McQuay representatives located in all principal cities.**



# McQuay Inc.

**1600 Broadway N. E., Minneapolis 13, Minn.**

HEATING • AIR CONDITIONING • REFRIGERATION

# OUR CHALLENGE STANDS...

## anything that can be made of steel sheets can be made of

Your very first sheet of Wheeling SOFTITE will prove to you that here is a galvanized sheet that is *different*. It's easier to work. No matter *how* you form it, Wheeling SOFTITE will not chip or crack! As a matter of fact, the zinc coating on this new ductile sheet is so *tight*-coated, you can use it to make anything that can be made of steel sheets.

As a result you can tight-crimp and lock-seam Wheeling SOFTITE without breaking the coating. It stays good-looking and rust-resistant far longer.

Make the test yourself. Put Wheeling SOFTITE through any operation and see if it isn't the most workable galvanized sheet you have ever used.

Get samples and full information today. Write Wheeling Steel Corporation, Wheeling, West Virginia.

**WHEELING**

**SOFTITE®**

**GALVANIZED SHEETS**

# IT'S WHEELING STEEL

**District Sales Offices:** Atlanta, Boston, Buffalo, Chicago, Cincinnati, Cleveland, Detroit, Houston, New York, Philadelphia, St. Louis, San Francisco, Wheeling.

"WHAT? **FAR-AIR** *filters pay for themselves in 18 months?"*

"Yes, sir. Many users report FAR-AIR filters save 75% of their original cost every year, too!"

*"How come?"*

"For one reason, they handle 50% more air than 'bargain brands,' so it takes 1/3 fewer filters to do the job."

*"Yes, but they cost more."*

"True, but you buy them only once—not over and over."

*"It costs money to clean them."*

"...but they hold 50% more dirt, last longer between cleanings and clean easier, so maintenance cost is 'way down."

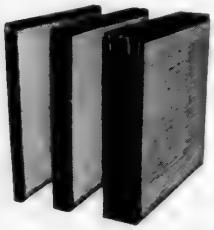
"In fact, FAR-AIR filters will save you enough over 'cheap brands' to pay for your original filter investment many times over."

*"You prove that and I'll buy!"*

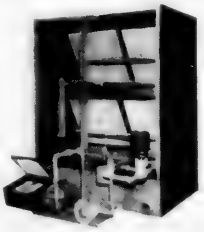
"Yes, sir, we'll start a test in your plant tomorrow."

If you would like a demonstration of FAR-AIR savings in *your* plant under *your* operating conditions, write or wire for a free evaluation test. You'll be glad you did!

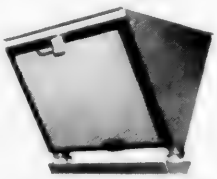
*Typical* **FAR-AIR** *Products*



1", 2" and 4" Thick Panel Filters



Self-Washing Filter



Grease Eliminator

**FARR**
**COMPANY**
LOS ANGELES • NEW YORK • CHICAGO • NEW ORLEANS

**Manufacturing Licensees:**
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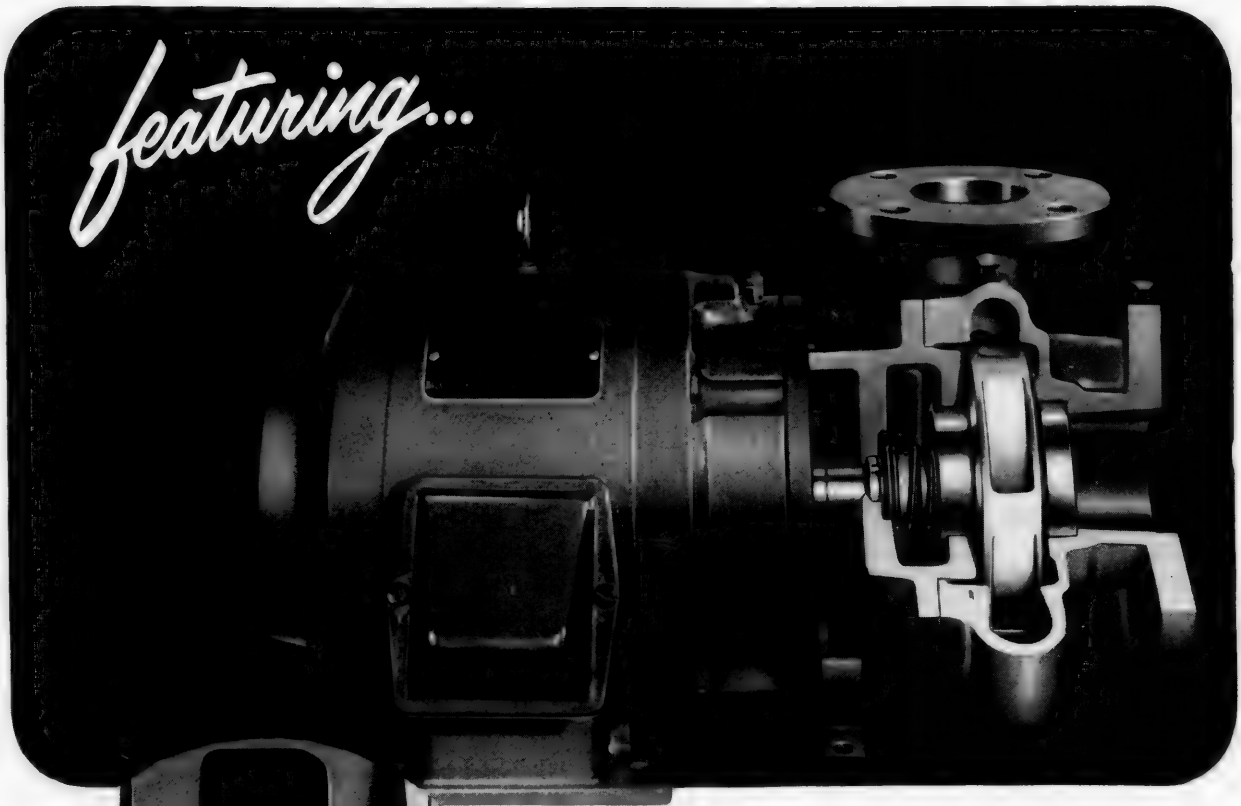
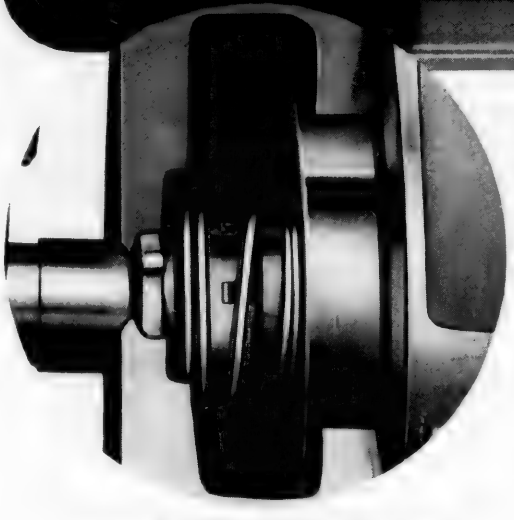
Montreal, Canada
The Clyde Engineering Co. Pty. Ltd.
Sydney, Australia
Intermit Ltd.
Birmingham, England

*Originators of* **FAR-AIR** *Certified Filter Service*

*featuring...*





*Leak-proof B&G "Remite" Mechanical Seal*

## FOR COOLING TOWER APPLICATIONS

# B&G SERIES 1531 TYPE B

# CENTRIFUGAL PUMPS

In the B&G 1531 Pump you'll find an impressive array of efficiency and performance features which will satisfy your most critical appraisal—

**The Motor.** Heavy duty with extra large shaft and over-sized bearings. Deep grooved radial thrust bearing counter-balances thrust load. Available *as open, splash-proof, totally enclosed or explosion-proof units.*

**Motor Pump Bracket.** Barrel type for maximum rigidity...counter-bored for perfect alignment. Support foot protects against vibration and strain.

**Pump Shaft.** High grade steel, super-finished for smooth, quiet operation and long life...oversized for minimum deflection. Gasketed sleeve protects against wear and corrosion.

**B&G "Remite" Mechanical Seal.** Eliminates leakage which occurs when a packing gland is used. A Carbon Seal Ring faces on a "Remite" floating seat—*a new material just a shade under a diamond in hardness*—gives trouble-free service when pumping liquid containing foreign material. The Seal is self-lubricating.

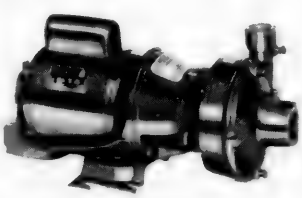
**One piece volute and suction cover.** Solid based with support foot. All the advantages of split-case design—no pipes to disconnect when servicing the pump. Rugged construction absorbs piping strains without transmitting stress to the motor shaft.

**Impeller.** Sound hydraulic design, mechanically balanced. Balance ring and relief holes reduce thrust. Precision fit on shaft assures easy removal and positive centering.

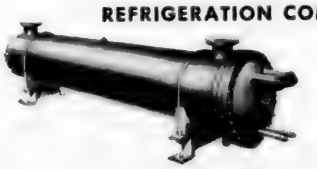
**Capacities and materials.** To 1100 GPM—420 ft. head. Available in all-bronze, all-iron and bronze-fitted units.

## SERIES 1522 CENTRIFUGAL PUMPS

Really *quiet*...both pump and motor are equipped with *long bronze sleeve bearings!* "Remite" Mechanical Seal ends leakage troubles. Bearing bracket assembly is interchangeable. Capacities to 150 GPM—heads to 115 ft.



## REFRIGERATION COMPONENTS



Complete line of Evaporators, Condensers, Heat Exchangers, Liquid Receivers and Package Liquid Coolers.

**BELL & GOSSETT**
**COMPANY**

**Dept. REN-4, Morton Grove, Illinois**

*Canadian Licensee: S. A. Armstrong, Ltd., 1400 O'Connor Drive, W. Toronto, Canada*

# This Crane valve has 20-year cost-free record on 400 psi. steam at 750° F.

Twenty years on this high-temperature steam boiler outlet service with never a wrench on it—that's valve performance in any man's language.

This Crane 8-inch No. 179U cast steel stop-check valve has racked up just such a record at Fort Bend Utilities Co., Sugar Land, Texas, and is working as smoothly today as it did two decades ago.

The Fort Bend Utilities plant—a subsidiary of the neighboring Imperial Sugar Co.—finds this Crane stop-check an important aid to boiler efficiency.

Its high-lift disc permits maximum flow-through, with minimum pressure drop under varying load conditions. Seating is instantaneous on back flow.

On manual closure, about once yearly for boiler servicing, the valve has never failed to respond smoothly and seat tightly.

To valve users experienced with Crane quality, this performance record is not so unusual. Thousands of Crane stop-checks throughout industry are giving similarly outstanding service.

The superior materials, the top-flight engineering and construction designed into all Crane valves give them service capacity and durability second to none.

Get these advantages next time you order valves: specify Crane and be *certain* of the valve service you want. Consult your local Crane Representative or write to address below.

**CRANE VALVES & FITTINGS**

**PIPE • KITCHENS • PLUMBING • HEATING**

*Since 1855—Crane Co., General Offices: Chicago 5, Ill. Branches and Wholesalers Serving All Areas*

# Refreshing*

*to the Eye, too!*

OVER **5** MILLION

***Curtis*** **prospects...**

***Your*** **prospects**

[redacted]

in
The Saturday Evening
**POST**

In a new, aggressive and *continuing* national advertising campaign to increase sales of Curtis equipment, this full-color sales message in the Post was driven home to more than **5** *million prospective buyers* of Curtis packaged air conditioning units.

If you are not a Curtis Dealer, and if you're qualified, *now* is the time to get started! You'll be selling the world's finest air conditioning equipment, *competitively* priced, and backed by a promotional-minded, on-the-go manufacturer with a solid 102 years of experience and skill.

Write today, and we'll show you how you can increase sales *and* profits with a complete, flexible line of Curtis Air Conditioning equipment.

Available in 6 exciting refreshing colors [redacted]

*yes...*

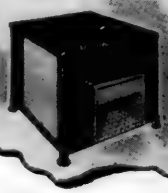
SUNNY PINK COLONIAL BLUE FRENCH GRAY FINN [redacted] POTTERY BLUE [redacted]

## this beautiful Curtis Air Conditioning Unit deserves to be seen!

No question about it. The new CURTIS packaged air conditioner *is* refreshing. It is also silent, dependable, efficient and economical to [redacted] and operate. It *refreshes* by circulating [redacted]mes of clean, crisp, dry, cool air [redacted] CURTIS packaged [redacted] a wide [redacted]es

*...and where water is a problem...*

## here's the answer!

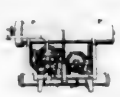


*Remember* you can count on...
*our 102nd year*

**Curtis**

MANUFACTURING CO.
Refrigeration Division
1999 Klenlen Ave., St. Louis 20, Mo.

Packaged air cooled air conditioning units



Packaged liquid chiller up to 100 tons

Industrial air compressors

Auto Lifts single & two posts

CM-15

# . . . Say "Trane"—and

**Trane Wall Line Convectors** combine *low initial cost* with *low installation cost* to meet even the tightest heating budgets. Designed for attractive wall-to-wall applications in schools, office buildings, hospitals and institutions . . . wherever *high capacity* and *economy* are a must. Unusually rugged construction with extra reinforcements and full back. Over-all cabinet heights 14″, 20″, 26″; depths 4″ and 6″; lengths to 72″.

# fill any radiation need!

*Nation's most complete line of fin-type radiation simplifies specifications and maintenance . . . concentrates responsibility.*

**CHURCH ROOM OR CLASSROOM,** hospital, home or factory—no matter what type of building or where—*no matter what type of radiation*—this one-source supply can cut design time and help you plan better.

Specifications are simplified, maintenance made easier. And the reason is simple. TRANE manufactures the nation's most complete line of fin-type radiation, so *you* can concentrate responsibility in *one* reliable source.

Since 1925 TRANE has led the way in developing and improving a broad line of radiation products. You can depend on TRANE quality and TRANE ratings in job after job after job. TRANE product literature is complete, easy to use.

So on your next job—say "TRANE." Call your nearby TRANE Sales Office, or write TRANE, La Crosse, Wisconsin.

*For heating, cooling, ventilating . . .*
*For any air condition, turn to*

# TRANE

**MANUFACTURING ENGINEERS**

THE TRANE COMPANY, LA CROSSE, WIS. • EASTERN MFG. DIV., SCRANTON, PA.
TRANE COMPANY OF CANADA, LTD., TORONTO • 90 U.S. AND 19 CANADIAN OFFICES

**Matched Trane products for *all* your heating needs**

**Force-Flo heaters** block cold air, stop drafts.

**Model H & P unit heaters** put heat where you want it.

**Torridor heaters** deliver large volumes of air long distances.

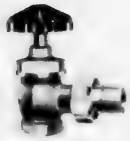
**Steam Specialties** include full line of valves, traps, vents.

**Trane Wall-Fin** brings draft-free heating to long wall and window areas. Large tube diameters make it especially suitable for loop systems where pressure drop is critical. Use single element where capacity requirements are low, multi-tiered elements where high capacity per lineal foot is required. Sloping-top cabinets or expanded metal grilles. Choice of 1¼" or 2" steel or 1" or 1¼" nominal copper elements.

**Trane Convectors** combine efficiency with compactness and beauty. Aluminum-copper heating element responds quickly, provides heat instantly . . . eliminates wasteful overheating common to other types of radiation. Ideal for homes, offices, institutions. Can be installed free-standing, recessed or wall-hung. 21 cabinet styles with flat or sloping tops. Knob or chain dampers optional.

**Trane Baseboard Convectors** assure your homeowner clients greater comfort by heating where the cold begins—along *outer* walls, *under* windows. Give greater freedom of furniture arrangement, add beauty to any home. And they may be installed up to 50% faster because cabinet and coil come preassembled, closures *snap* together. Nonferrous heating element. 8¼" and 12" heights.

## MARSH PACKLESS RADIATOR VALVES



WHEEL HANDLE

GRADUATED

LOCK AND SHIELD

ANGLE PATTERN

GLOBE PATTERN

CORNER PATTERN (Sectional Below)

## MARSH THERMOSTATIC RADIATOR TRAPS

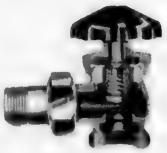
ANGLE PATTERN

STRAIGHTWAY PATTERN

VERTICAL PATTERN

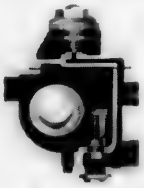
LEFT HAND CORNER PATTERN

RIGHT HAND CORNER PATTERN



CUT OPEN VALVE

## F&T TRAPS

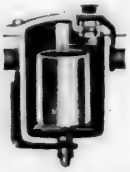


No. 12, REPRESENTATIVE OF WIDE LINE

## VENTS

No. 5 VENT, ONE OF MANY

## BUCKET TRAPS

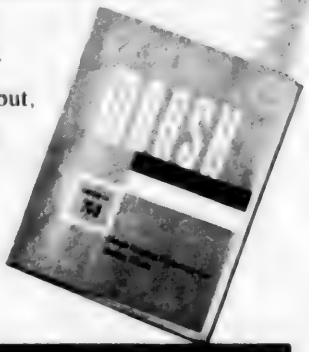


No. 500 INVERTED BUCKET TRAP

# All the best of their kind!

You probably have made certain Marsh products your standbys without realizing there are a lot more of them just as superlative as the ones you like so well.

Make the acquaintance of some of them here, but, better still—***Ask for this Marsh Catalog!***




**MARSH HEATING EQUIPMENT CO.**
Sales affiliate of Jas. P. Marsh Corporation
**DEPT. U, SKOKIE, ILL.**
Marsh Instrument & Valve Co. (Canada) Ltd.
8407 103rd St., Edmonton, Alberta

**MARSH**
*Heating Specialties since 1865*

## MARSH BOILER GAUGES

THER-ALTI-METER (Square and Round)

INTERNAL SYPHON (Square and Round)

OUNCE-GRADUATED RETARD (Also Compound)

STANDARD (Also Compound)

# THE NEW UNARCO DYNA-PAC

**...FEATURING BOTH ECONOMY AND EFFICIENT LONG LIFE**

- **2-, 3-, 5-ton capacities in water-cooled or air-cooled models**
- **For residential and commercial installations**
- **Selective manual humidity control**
- **Built-in plenum**
- **4-way adjustable top air discharge on free blow models**

The all-new UNARCO Dyna-Pac meets the challenge of better air conditioning at lower cost. What's more, it was designed with the installing contractor in mind. All Dyna-Pac units are pre-wired and pre-piped for easy, low-cost installation.

There is economy in both the low initial cost and minimum maintenance required. There is also economy of space with the compactly designed DYNA-PAC. Duct models can be attached to existing warm air heating systems to provide year 'round conditioning.

The Royal-Aire—by UNARCO—representing the ultimate in packaged air conditioning equipment. Available in 5 models, 3 through 15 h.p.

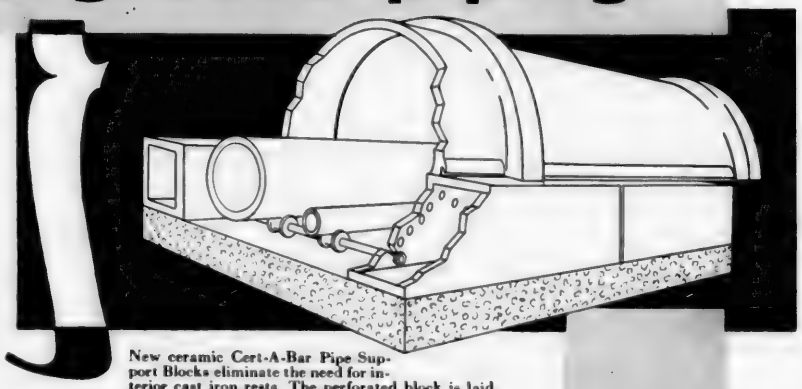
UNARCO **AIR CONDITIONING PRODUCTS**

*National-U. S. Radiator Corporation*
JOHNSTOWN, PENNSYLVANIA

**HAVE YOU ENROLLED IN UNARCO'S DEALER PLU$ PLAN? WRITE NOW FOR FULL DETAILS OF BIG DEALER AWARD PROGRAM.**

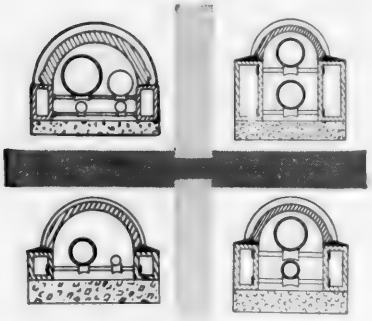
# PERMANENT PROTECTION
## for underground piping!

## STILLWATER CERT-A-BAR* TUNNEL CONDUIT SYSTEM



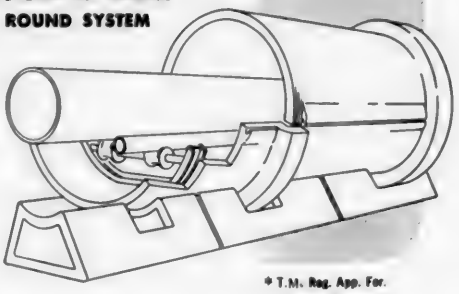
New ceramic Cert-A-Bar Pipe Support Blocks eliminate the need for interior cast iron rests. The perforated block is laid as a structural support member at regular intervals, and the bars are simply inserted and locked in place.

THE vital consideration in selecting an underground conduit system is *permanent* protection . . . not for one year or five, *but for the life of the piping.* You get the best possible protection for your underground metal service piping with a Stillwater Conduit System of vitrified clay. It's chemically inert—can't rust, rot, corrode, or decay . . . ever. And it is manufactured in accordance with ASTM specification C-13-54, assuring proper strength and quality. Any combination of service piping can be protected. Conduit is available in a wide range of sizes, with a complete line of fittings and accessories, including alignment guides, lateral guides, and anchors. Any contractor's crew can handle the installation easily, or if you prefer, Stillwater Licensed Installers will assume the responsibility. The Cert-A-Bar Tunnel System can be installed with any of three suggested new waterproofing specifications—one for average conditions, one for intermittent ground water conditions, and a third for high water table conditions. It's the lowest-cost conduit per year of service that you can specify or install!



A few of the hundreds of possible combinations of piping for the Cert-A-Bar Tunnel System are shown at left. At right is the Lock-A-Bar Round System, used largely for short runs and replacement of other conduit.

**LOCK-A-BAR***
**ROUND SYSTEM**



* T.M. Reg. App. For. Patents Pending.

**WRITE FOR**
new four-page file-size brochure, with full details

**The Stillwater Clay Products Co.**
**STILLWATER CONDUIT DIVISION**
3334D PROSPECT AVENUE, CLEVELAND 15, OHIO

STILLWATER CONDUIT SYSTEMS

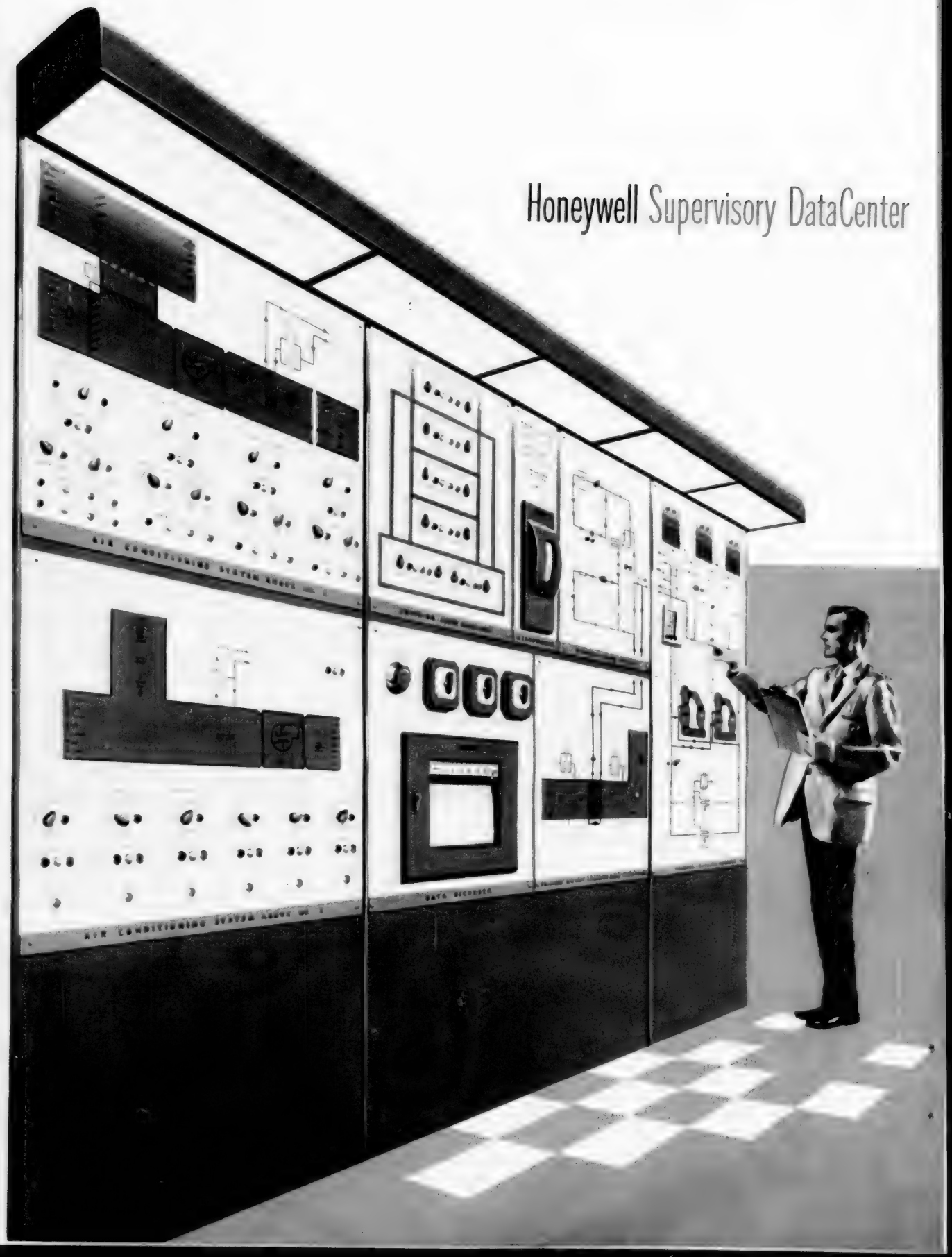
SW-956-70

**Honeywell Supervisory DataCenter now brings**

# ADVANCED AUTOMATION TO AIR CONDITIONING!

**...a bold new concept for economical year-round climate control**

# Honeywell Supervisory DataCenter



**Now one man can operate a building's entire air conditioning system from a single panel**

Advanced automation in air conditioning, made possible by the Honeywell Supervisory DataCenter, has resulted in many remarkable achievements in practically every phase of indoor climate control.

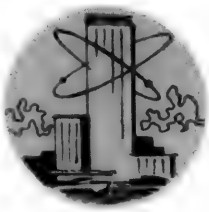
New techniques of automation, instrumentation and electronics make air conditioning as automatic as possible and provide for efficient supervision.

Operating efficiencies have been realized that were never believed possible. To the public it has brought a new standard of comfort. And to the engineer and architect it offers the opportunity to dramatize the use of air conditioning and provide flexibility of design that will avoid obsolescence for years to come.

And remember, every component in a Honeywell Supervisory DataCenter is made by Honeywell, backed by Honeywell's dependable service.

# saves steps for operating personnel, thousands of dollars for building owners

*Focuses all eyes on air conditioning.* Publicly displayed, a colorful Honeywell Supervisory DataCenter does a lot to highlight a building's "hidden" deluxe comfort features.

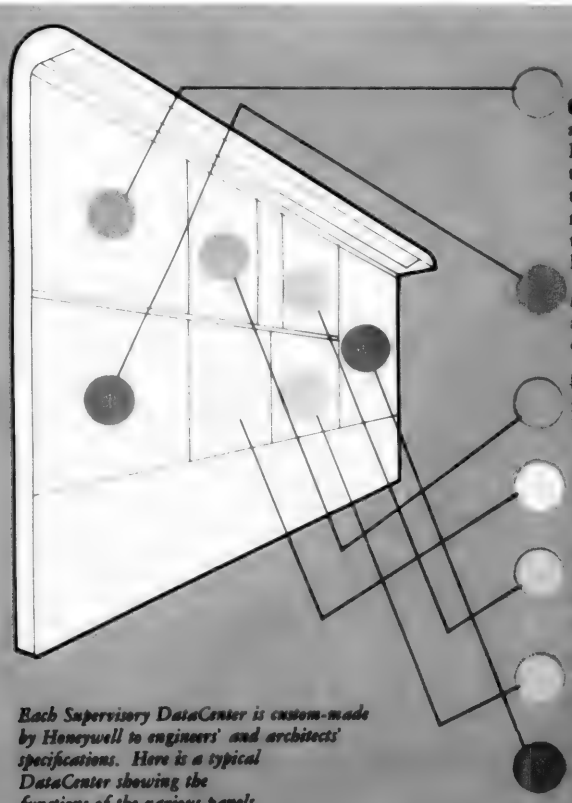


*DataCenter does the "leg work."* Readings from any remote point in the building come to one central control panel—eliminating the need for manual floor-by-floor checking.

*Central control of every floor.* Temperature in open areas on every floor, plus functions in the complete system are always under fingertip control at one central point.

*Savings liquidate equipment cost.* A DataCenter combines a number of operating maintenance jobs into *one*—also detects operating irregularities to aid trouble shooting.

*Better individual room thermostat control.* A DataCenter improves space thermostat performance by permitting closer supervision of the primary heating and cooling supply.



*Each Supervisory DataCenter is custom-made by Honeywell to engineers' and architects' specifications. Here is a typical DataCenter showing the functions of the various panels.*

**Central Supply Units.** Provides remote adjustment of mixed air and coil deck temperatures, plus coil air temperature readings. Final space temperature is determined by local pneumatic thermostats that regulate the percentage of air passing through the coil deck and the bypass for each zone. (These temperature readings—as well as those concerned with other panel functions in the complete system—are shown by the indicator located on the vertical top center panel.)

**Annex Units.** These units control space temperatures in the annex. Temperature corrections are made by means of the control point adjustment knobs located on the building outline.

**Interior Space Temperatures.** Building outline provides graphic floor-by-floor picture of the interior space thermostats. Push-button control and adjustment may be made from the panel.

**6-Point Temperature Recorder.** To permit careful analysis of operations, this instrument gives a simultaneous record of any 6 temperature pickups in the entire system.

**Basic Heating and Cooling Circuit.** Start-stop buttons control circulating pumps; pilot lights indicate which equipment is operating. Panel also provides several push-button temperature readings with adjustment of controlling thermostats.

**Primary Air System.** This section provides push-button temperature readings, and adjustment of thermostats controlling reheat and dehumidifier coils.

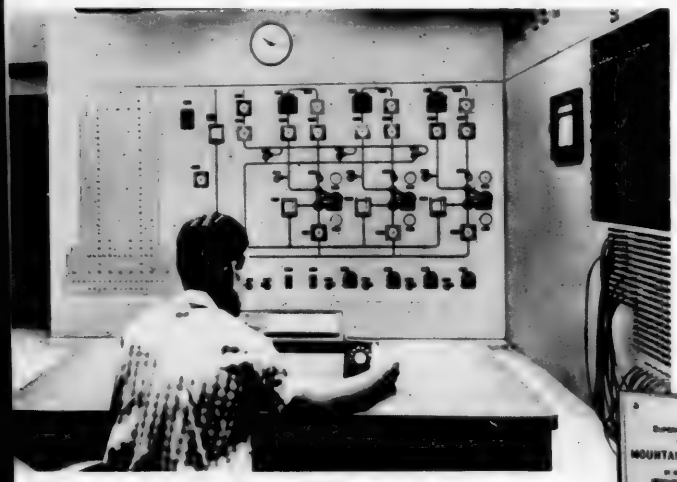
**Basic Refrigeration Plant Supervision.** Shown here is color diagram of the system with miniature controller for remote indication and adjustment of chilled water temperature. Accessory equipment can be started and stopped at the panel—pilot lights indicate when they're running. Push buttons provide temperature readings at all key points in this system.

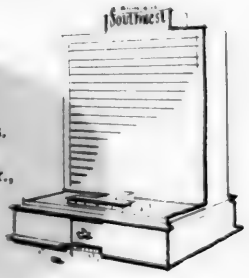
# In every sized building, architects and engineers acclaim "the new visibility"

Air conditioning represents up to 25% of a modern building's cost. Until now this valuable asset has been a hidden maze of ducts, pipes and equipment. Tenants and customers had no real awareness of the necessary investment and continuous supervision required to give them comfort.

This is another reason why Honeywell Supervisory DataCenters are being hailed with such enthusiasm. It offers recognition where it is due. The display factor gives the owner a decided rental advantage, and at the same time offers highest compliments to the engineer's and architect's professional skill.

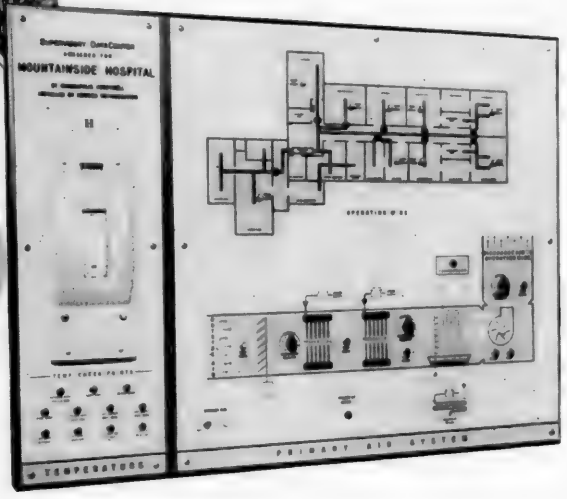
**Here are three typical Supervisory DataCenters—ranging from large to small.**

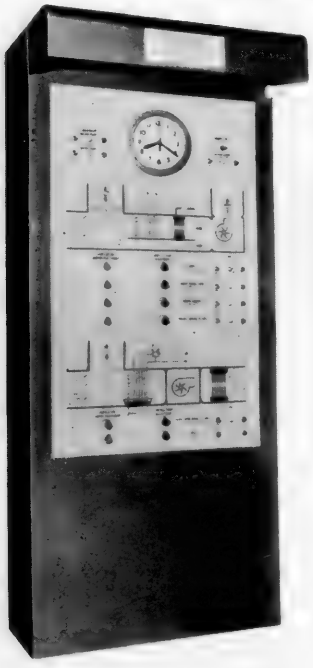





***Bank of the Southwest Building,*** Houston, Texas. Kenneth Franzheim, Architects; H. E. Bovay, Jr., and Reg. F. Taylor, Engineers; Straus-Frank Company, Contractor.

***Mountainside Hospital,*** Montclair, New Jersey. Monsen, Contractor and Engineer



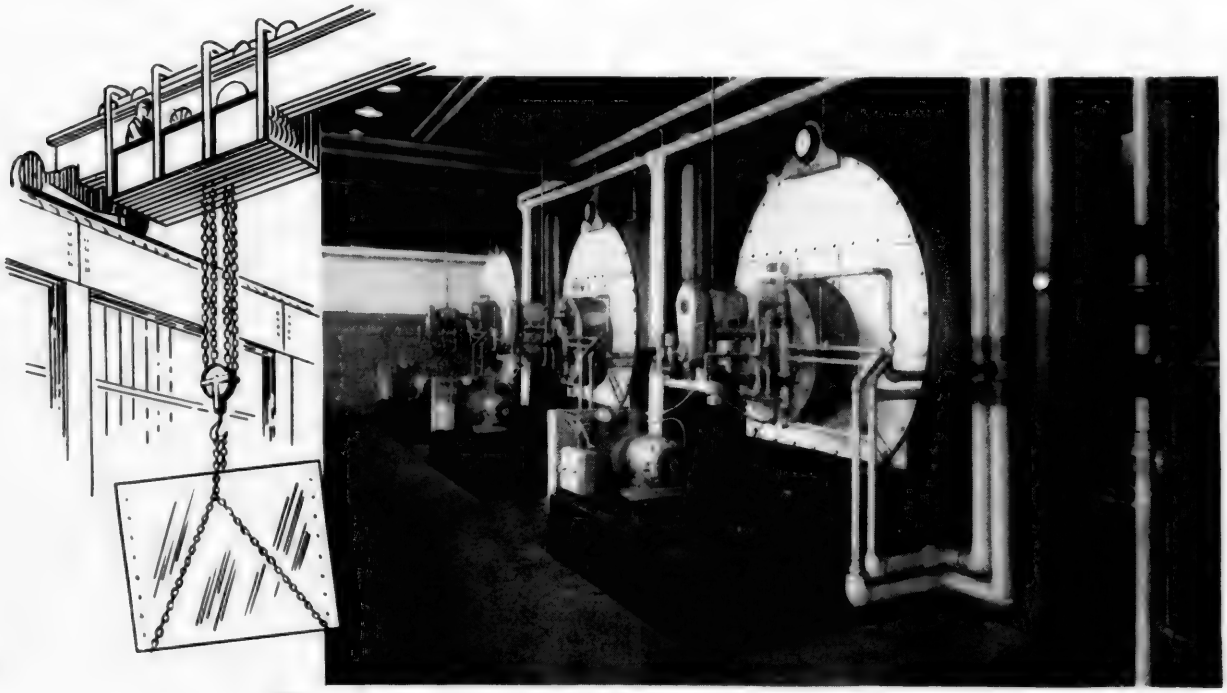
***Shreveport Club,*** Shreveport, La. Neild-Somdal-Associates, Architects; Carl M. Hadra Associates, Engineers; Mechanical Contractors, Inc., Air Conditioning.

*If you would like more information about Honeywell Supervisory DataCenters, call your local Honeywell office, or write Minneapolis-Honeywell, Dept. SDC-1, Minneapolis 8, Minnesota.*

SUPERVISORY DataCenter

a product of MINNEAPOLIS **Honeywell** First in Controls

# *from Steel Plate to Steam Production*



## *only* SUPERIOR *takes all these steps to insure Satisfaction...*

HEAVY DUTY DESIGN

Bigger, heavier and more ruggedly designed, Superior Steam Generators are integrated engineered so that all components are matched in size and function to one another.

CODE CONSTRUCTION

5 sq. ft. of heating surface per b.h.p. . . . induced down-draft design . . . sized to capacity boiler shells . . . for longer life at high efficiency.

FACTORY FIRE TESTED

Completely fire tested before shipment . . . adjusted to peak performance, and guaranteed on the basis of these actual tests.

SHIPPED COMPLETE

Set it on any floor capable of supporting its weight; tie into fuel, steam and electric lines, and you are ready to start producing steam . . . efficiently and economically.

STARTED ON THE JOB BY FACTORY TRAINED EXPERTS

Superior responsibility ships with the boiler in the form of a factory trained expert, on hand to start the boiler, to adjust it on the job to peak performance, and to instruct operating personnel.

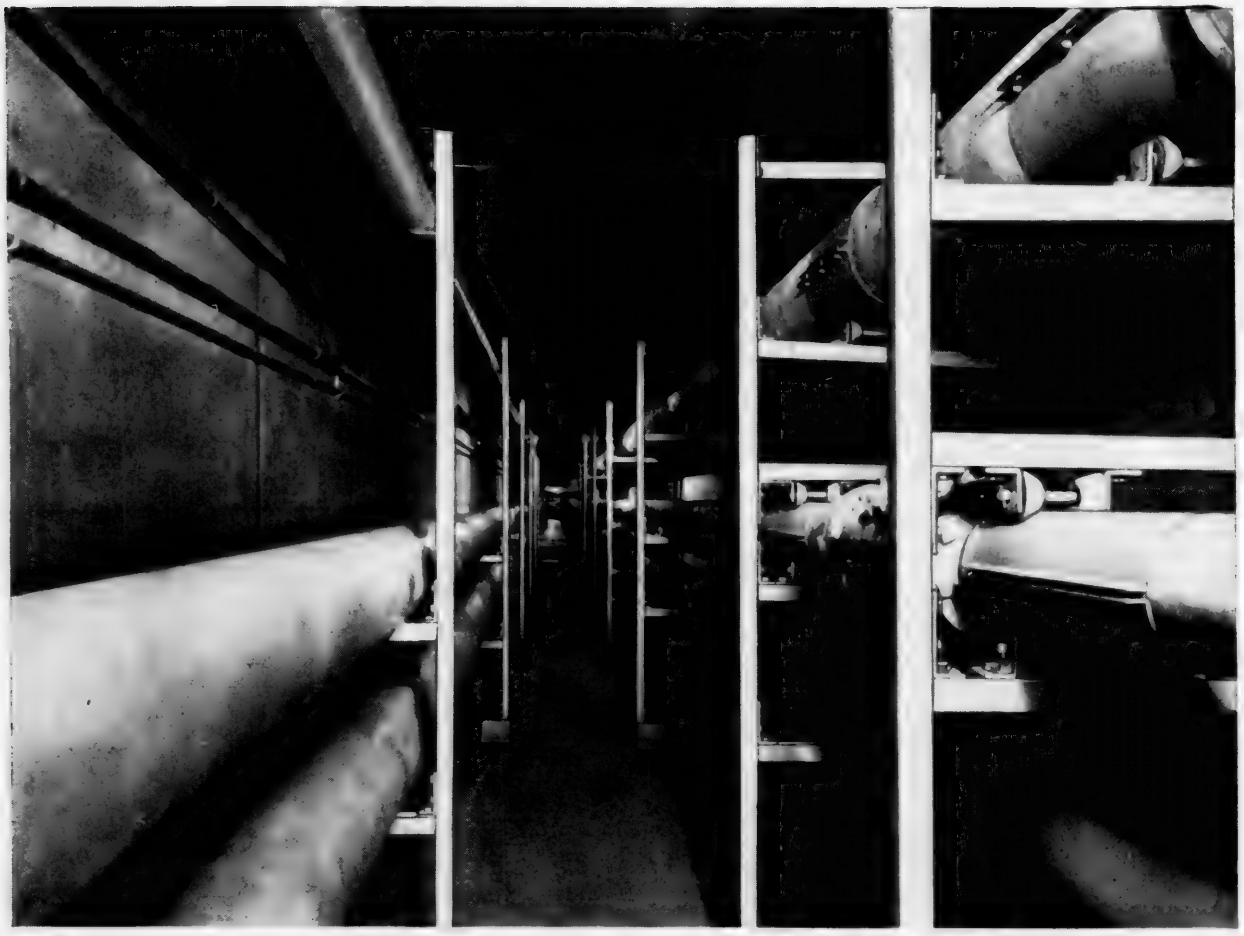
Because Superior Steam Generators are complete packages, designed, engineered and built by Superior Combustion Industries, Inc., they are backed by undivided responsibility . . . responsibility that goes beyond manufacture, and includes factory fire testing before shipment, and factory trained personnel at the installation point to start the boiler initially, adjust it to peak performance, and to advise the operating engineer on how to get the most out of the unit.

Superior Steam Generators are not only designed and built better, they are given the right start on the job.

*18 sizes from 20 to 600 b.h.p. for pressures up to 250 p.s.i. or for hot water. For complete details, write for Catalog 819.*

SUPERIOR COMBUSTION INDUSTRIES INC.
SUPERIOR STEAM GENERATORS
TIMES TOWER, TIMES SQUARE, NEW YORK 36, N.Y.

**Plants in EMMAUS and WILKES-BARRE, Pennsylvania**



# For faster, easier pipe-racking, use versatile UNISTRUT® channel

Look how quick, easy and economical it is to install racking with UNISTRUT steel framing:

(1) Cut UNISTRUT channel to length;
(2) slide in the UNISTRUT nut;
(3) tighten with a wrench. That's all!

Better still, you get everything you need in the complete UNISTRUT line—channel, clamps, hangers, concrete inserts, rollers, or any other accessories your installations require.

Think how this advanced method can cut your costs! No drilling, welding or riveting. No fussing to get exact slope or pitch—UNISTRUT framing is completely adjustable. And it's easy to alter or add to the installation any time—the UNISTRUT system is extremely flexible.

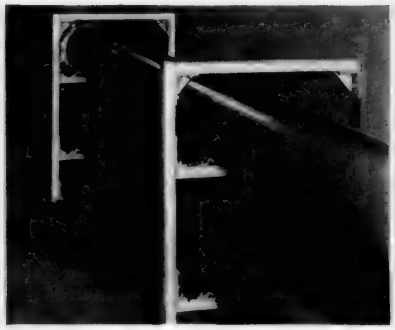
Here is the foolproof, economical method for superior support of steam, gas, heavy water, light conduit or air-conditioning lines. Find out about UNISTRUT framing now!

*Write Dept.V-10 for 78-page Catalog No. 700, giving complete information.*

**UNISTRUT PRODUCTS COMPANY**
**933 W. Washington Blvd., Chicago 7, Illinois**

**UNISTRUT framing supporting unit heater—a tricky job made easy through horizontal and vertical adjustability of UNISTRUT.**

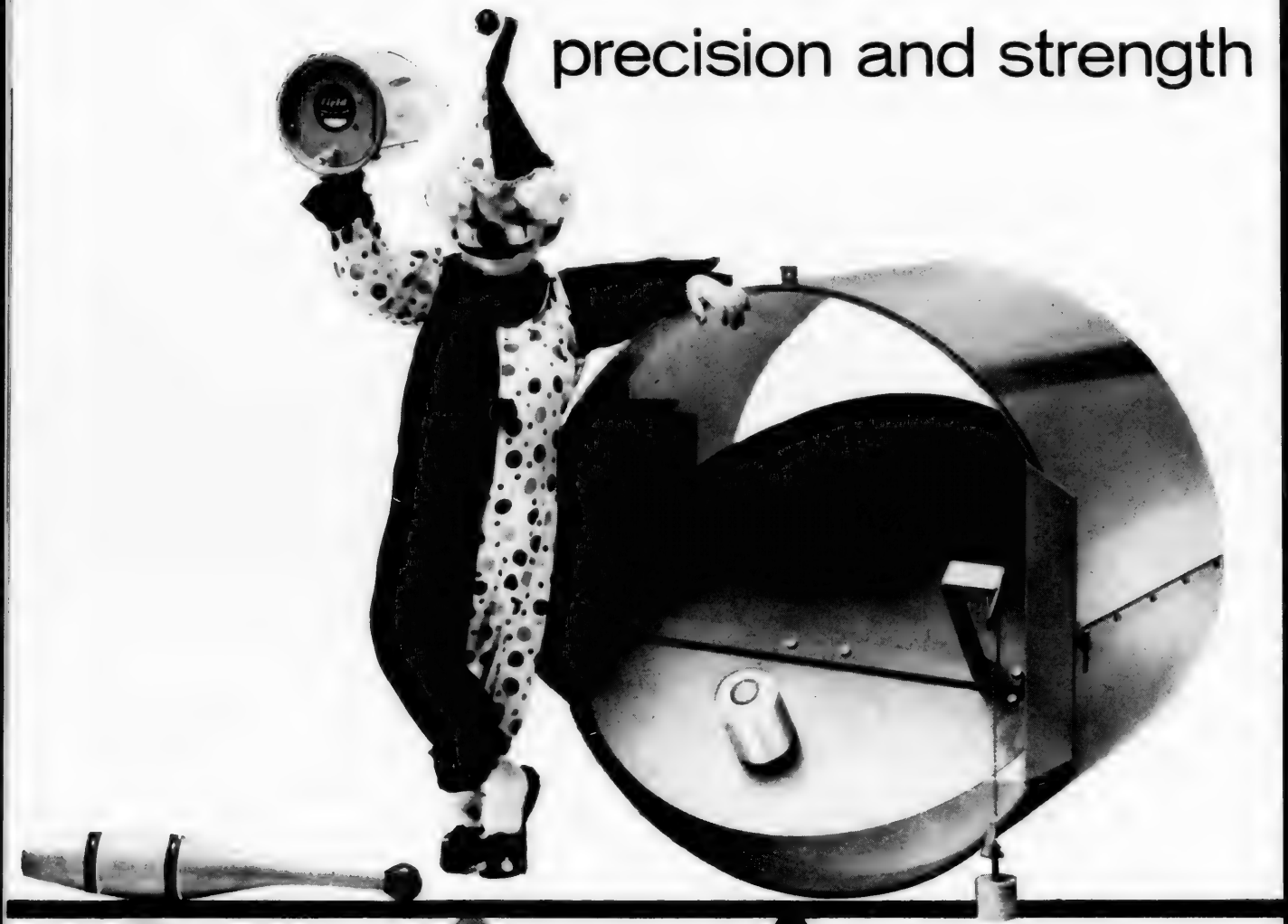
**UNISTRUT framing—with UNISTRUT concrete inserts—supporting heavy water and sludge lines.**



U. S. Patent Numbers 2327587 2329815 2380379 2363382 2345650 2541908 2405631 2696139 Other Patents Pending

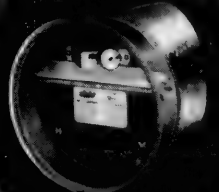
# midget or GIANT

## Field draft controls provide both precision and strength



**SIZES 6" THRU 32"**
Field "M" Controls for oil and coal fired domestic, commercial and industrial heating plants

**SIZES 8" THRU 32"**
Field "MG" Double-Acting Controls for gas fired commercial and industrial heating plants



**SIZES 6" THRU 9"**
Field "RC" Controls for domestic oil and coal fired heating plants, for flue sizes 5" through 10"

**FIELD CONTROL DIVISION**
of H. D. Conkey & Company, Mendota, Ill.
AFFILIATES:
Conco Building Products, Inc. • Brick, Tile, Stone
Conco Materials Handling Div. • Cranes, Hoists

Represented in Canada by Ontor Limited,
12 Leswyn Road Toronto 10, Ont., Canada

field

*l. to r.* Consulting Engineer J. M. Schweiger, Planning Director R. A. Flynn, City Manager H. W. Starick, Safety Director C. W. Horlacher, and R. J. Perkins, manager of American Blower's Dayton office, review plans for the Safety Building's air handling equipment.

# They're creating another "first" for Dayton

With a reputation as one of the nation's most progressive cities, Dayton, Ohio, has an impressive number of "firsts" to its credit. Dayton, for example, was among the first to employ the popular city-manager type of local government.

The conference pictured above concerns an air conditioning first for Dayton.

For, the new Safety Building — housing all police division functions and municipal courts — is the first building owned by the City of Dayton to be fully air conditioned.

American Blower is a major supplier of air handling equipment for air conditioning and heating and ventilating in the Safety Building. Indoor temperatures are pleasantly fresh and cool — thanks to the efficient operation of American Blower air handling equipment which handles a portion of the air conditioning load.

The Dayton Safety Building's system is another example of the quality products combined with helpful on-the-spot local service you get when you specify "American Blower." American Blower Corporation, Detroit 32, Michigan. In Canada, look for Canadian Sirocco products.

Safety Building, Dayton, Ohio. Owner: City of Dayton. Associated Architects: Harry I. Schenck; Lorenz & Williams; Freeman A. Pretzinger. Consulting Engineers: Schweiger, Heapy & Associates. General Contractors: Frank Messer & Sons, Inc. Mechanical Contractors: Huffman & Wolfe Company.

**AMERICAN BLOWER**

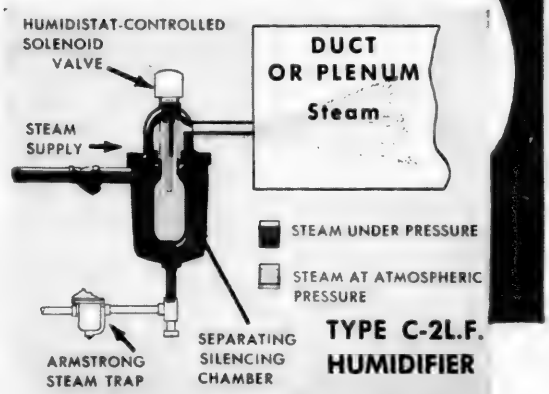
Division of AMERICAN-Standard

**Air conditioning equipment for every business**

# a Practical Answer to Central Humidification

## . . . ARMSTRONG STEAM HUMIDIFIERS

• Automatic Control • No Dripping
• No Sludge or Scale




### Low Cost . . . Low Maintenance

Armstrong Steam Humidifiers, connected to discharge into ducts or plenum chambers, provide automatic, low cost, trouble-free central humidification.

They are ideally suited to original installations, and also have been widely used to replace troublesome, old-fashioned pan and steam coil or perforated steam pipe humidifiers.

Their low maintenance is highly regarded by users. Gone are the problems of drilling out scaled-up pipes or cleaning sludge and scale from pans and coils.

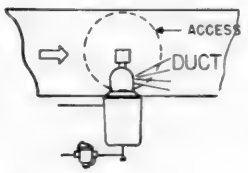
There is no dripping. Control is accurate (within 2% to 4% of humidistat setting). There is no problem of condensation. Installation is simple. Servicing is simple and infrequent. Valves and glass wound solenoid coils last indefinitely. Armstrong Humidifiers are unconditionally guaranteed to satisfy.

Three sizes are available with capacities ranging from 25 to 1280 lbs. of steam per hour. Air-controlled models also are available.

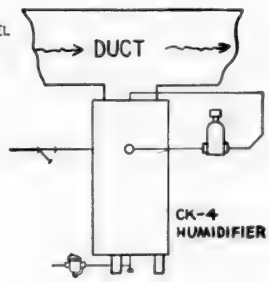
For complete selection, installation and price data, call your local Armstrong Factory Representative, or write:

**ARMSTRONG MACHINE WORKS**
**846 Maple St., Three Rivers, Michigan**

Type CK-4 Humidifier discharging into space heater.



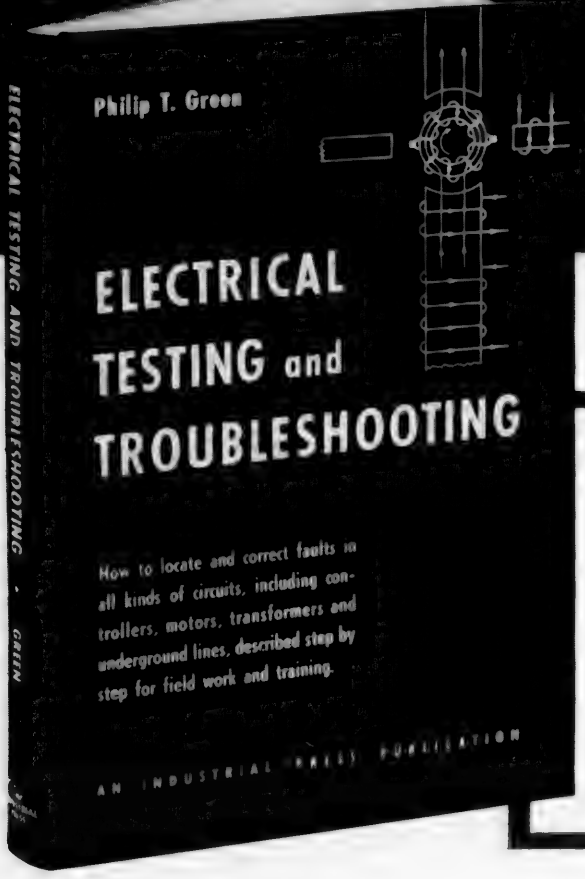

Type C-2L.F. Humidifier installed with discharge outlet inside duct. These units can also be installed outside duct with pipe from outlet connected into duct.




Type CK-4 installed below large duct. Can also be installed horizontally.

**ARMSTRONG STEAM HUMIDIFIERS**

# JUST PUBLISHED — A NEW BOOK


Philip T. Green
ELECTRICAL TESTING and TROUBLESHOOTING
How to locate and correct faults in all kinds of circuits, including controllers, motors, transformers and underground lines, described step by step for field work and training.
AN INDUSTRIAL PRESS PUBLICATION
ELECTRICAL TESTING AND TROUBLESHOOTING
GREEN

**HERE ARE SIMPLE, STRAIGHT-FORWARD PROCEDURES FOR ELECTRICAL TESTING AND TROUBLESHOOTING —PROCEDURES THAT HAVE BEEN PROVEN IN PRACTICAL FIELD TESTS.**

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# ELECTRICAL TESTING and TROUBLESHOOTING

Simple, straightforward, *tested* procedures for electrical troubleshooting are now brought to you by an expert in ELECTRICAL TESTING AND TROUBLESHOOTING. These procedures are explained so clearly that this book will prove extremely useful as a training text as well as a working manual for practicing electricians and others concerned with the use and maintenance of electrical equipment. Examine the table of contents at the left and you'll see its thorough coverage. You'll find your own problems greatly simplified when you have this book to guide you.

## Covers All These Subjects

This book shows you how to locate and correct faults in circuits of all kinds, including — controllers, motors, transformers and transmission lines. A simplified briefing on electrical symbols and diagrams is followed by detailed discussions of these topics:

- Analyzing and charting controller operation
- Insulation testing
- Electromagnet windings
- Single phase transformers
- Polyphase transformers
- Synchronous motors
- Troubleshooting test equipment
- Locating grounds
- D.C. machine windings
- Phase sequence
- Induction motors
- Power cable faults
- Bearing Lubrication

References to applicable codes and standards are included for each subject treated.

From the standpoint of personnel safety, another outstanding feature of the book is that most of the tests are performed with the equipment isolated from the power line. Current in these tests is supplied by dry cells or residual magnetism, so that accidental contact and short circuits are less hazardous to both men and machines.

## About the Author

Philip T. Green, the author of ELECTRICAL TESTING AND TROUBLESHOOTING, is Industrial Training Coordinator of the Panama Canal Zone Company. He has been associated with this organization since 1937. Previously he had been a Teaching Fellow at the University of Cincinnati, where he received both his B.S. and M.S. degrees in Electrical Engineering. In addition to his background in industrial training and electrical engineering, the author has also served as educational advisor to units of the International Brotherhood of Electrical Workers.

## Tested, Timesaving Procedures

All of the troubleshooting procedures described have been tested in the field and proven to be great time-savers — especially for locating obscure sources of trouble. And you'll find a mere basic knowledge of simple arithmetic sufficient for you to understand and use these procedures. The author's teaching experience has enabled him to arrange the entire book in easily understandable units. When you examine ELECTRICAL TESTING AND TROUBLESHOOTING, you'll agree it's one of the most useful books yet published on the subject. The coupon below makes it easy for you to order your copy now!

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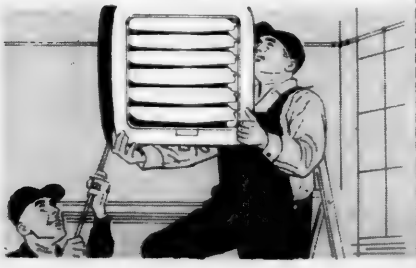

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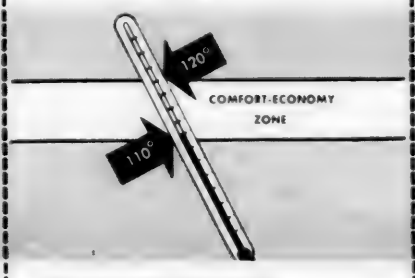


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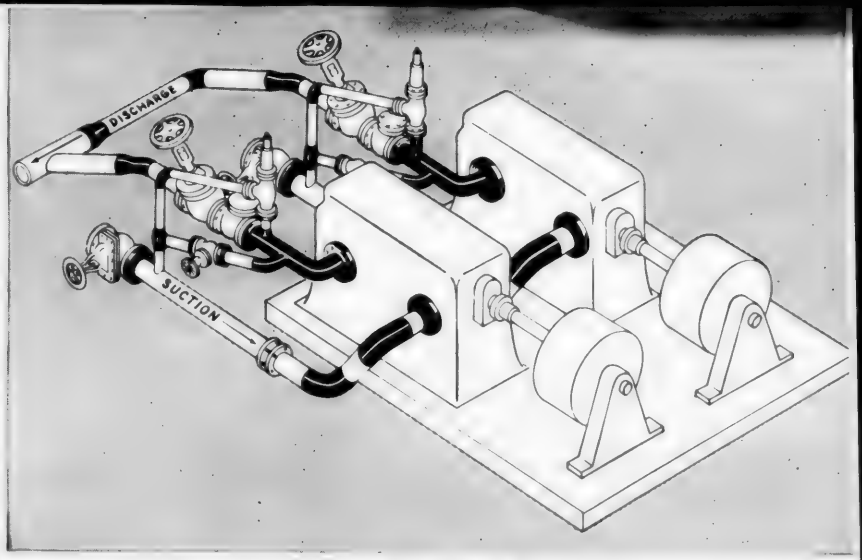


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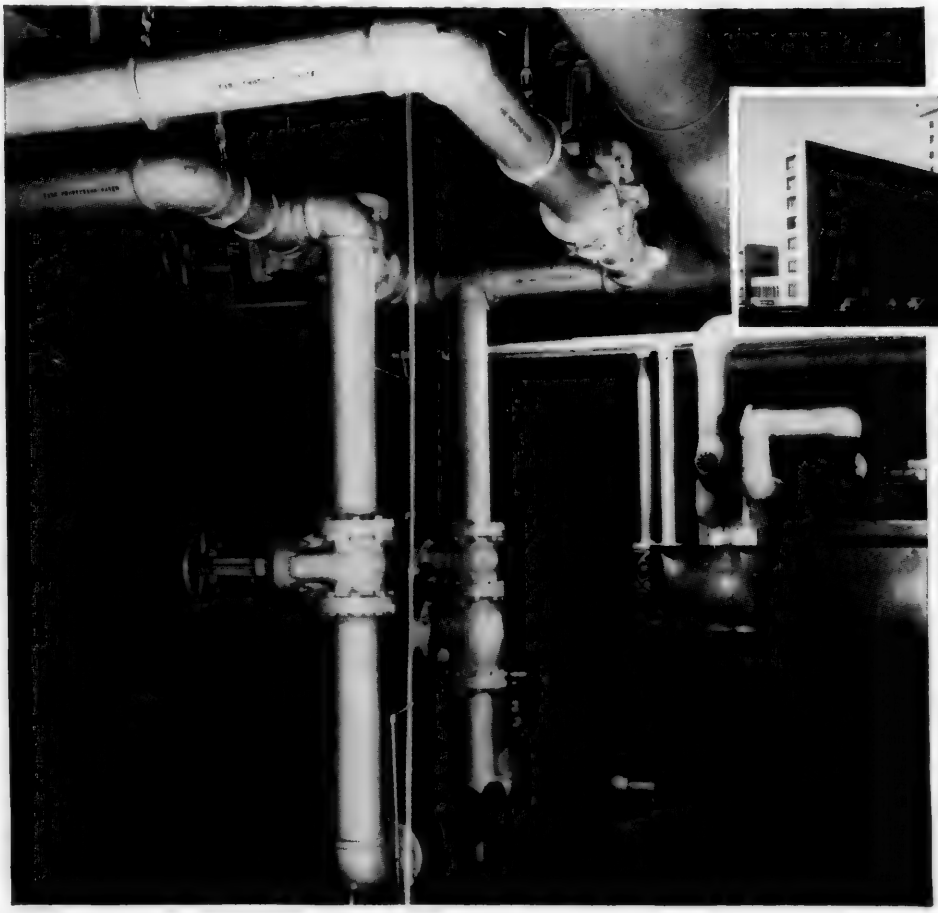

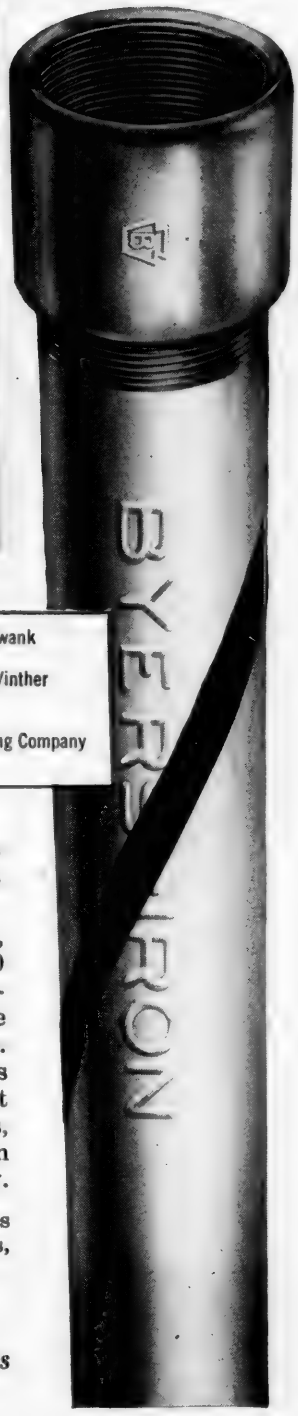


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Dallas, Texas

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Here, as a safeguard against corrosion and premature maintenance, wrought iron pipe was specified for six essential services. More than 100 tons were used for hot and cold water lines 6″ and larger, all fire protection lines, high pressure steam returns, medium and low pressure steam returns, fuel oil piping, and underground condensing water lines.

With today's high repair and replacement costs, wrought iron pipe's proved ability to last longer, at lower cost-per-year, is more important than ever before. If you are concerned with piping for corrosive services, it will pay you to get acquainted with the facts. They are available in our bulletin, *Piping for Permanence.* Write us today for your copy.

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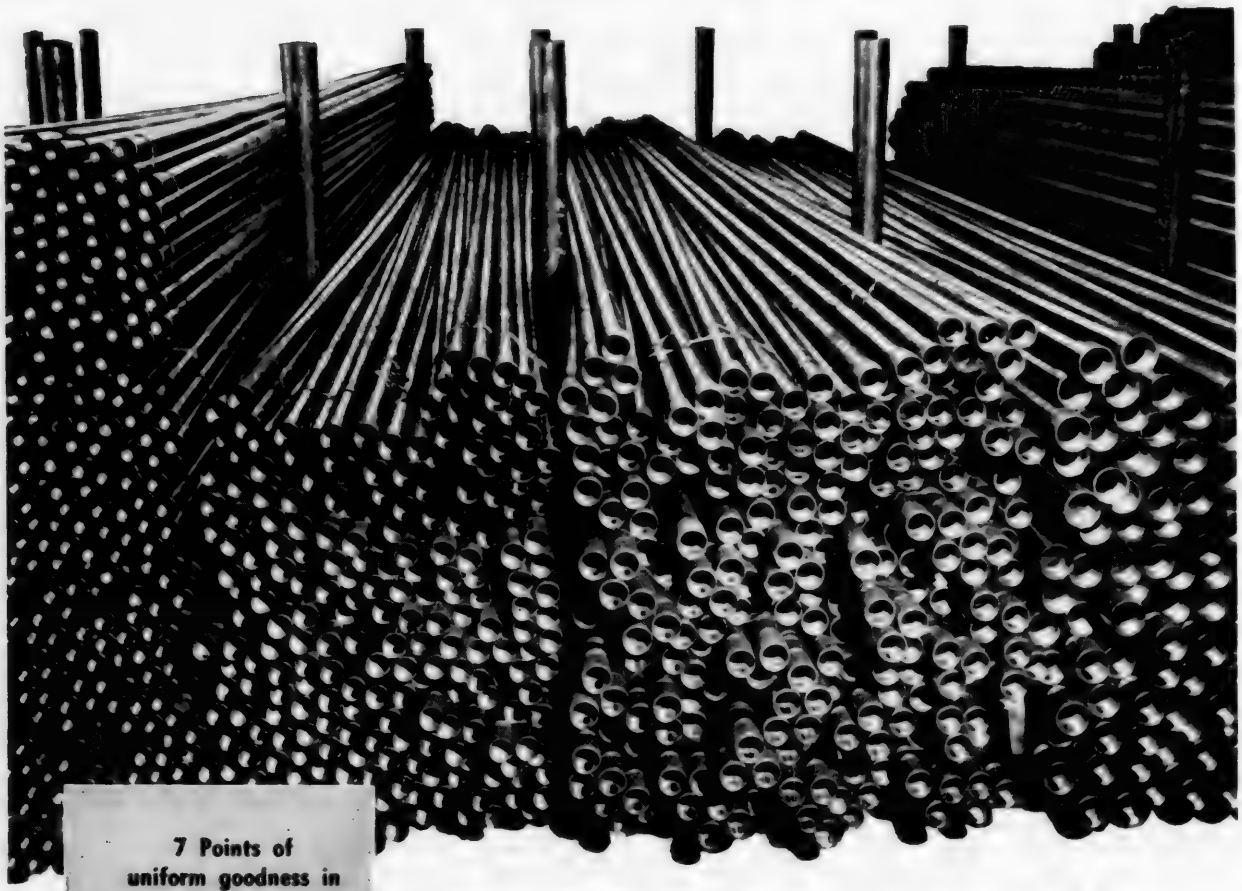

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- uniform ductility
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- uniform weldability
- uniform wall thickness and size
- uniform strength and toughness
- uniform roundness and straightness

You may compare the importance of uniform lengths of Youngstown Pipe with having the right tool for a job . . . the right nut for a bolt . . . the right washer for a fitting. There's no lost motion. The length you specify is the length you get.
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**Grilles and Registers** **Air Patterns**

Practical Data on Air Distribution

Prepared by the Engineering Department of Tuttle & Bailey, New Britain, Connecticut

# Selecting the Throw

As a service to those responsible for specifying air distribution equipment, Tuttle & Bailey will publish a series of technical articles on this all-important phase of heating, ventilating, and air conditioning systems. It is hoped these articles will be of help to the newcomers in the field and serve as "refresher" information for others.

By definition, "throw" is the distance or radius in feet that an air stream travels from its point of discharge to a point at which a desired terminal velocity is reached. Determining the correct throw for an installation of ceiling diffusers or sidewall grilles and registers is a matter of careful analysis of job conditions and application of the following basic principles.

## Ceiling Diffusers

The terminal velocities recommended below are necessary to provide satisfactory performance because of the rapid rate of temperature and energy equalization provided by the circular air pattern.

●

100 FPM Terminal Velocity
30 FPM Average Residual Velocity

Recommended where people are located adjacent to walls of structure for extended periods of time at sedentary occupations:

Private offices — Residences
Apartments — Hotel bedrooms
Hospitals, Private rooms, and Wards

●

150 FPM Terminal Velocity
50 FPM Average Residual Velocity

Recommended where people are not located adjacent to walls of structure for extended periods of time:

General offices — Department stores
Restaurants — Clothing stores
Theaters — Operating rooms — Churches

●

200 FPM Terminal Velocity
70 FPM Average Residual Velocity

Recommended where people are not located adjacent to walls of structure at any time:

Industrial plants — Corridors
Process areas

All other factors being equal, the use of different terminal velocities will affect the throw of a given size diffuser when handling a given CFM, and also the residual velocities in the occupied space. For example, if a diffuser with a 9′ throw at 100 FPM terminal velocity is selected when the measured throw is 12′, the remaining 3′ will be properly conditioned although the terminal velocity at the 12′ point will be lower than that originally chosen for the installation. The residual velocity will also be somewhat reduced. In cases where the measured throw is somewhat less than that provided by the selected diffuser, results will be satisfactory even though the terminal and residual velocities at the end of the measured throw will be higher than that originally selected.

Most diffusers are installed in rooms with ceiling heights of 8′ to 12′ and this variation will not affect diffuser selection. However, when ceiling heights are above 12′, a corrected procedure should be used:

1. Measure distance from diffuser to nearest wall or opposing air stream.
2. Measure distance from ceiling to a point 12′ from floor. Add to the distance in Step No. 1, 75% of the difference between the actual ceiling and the 12′ height.
3. Use this value as the total throw and select diffuser for desired terminal velocity.

For installations with excessive ceiling heights, it is advisable to increase the CFM per diffuser and use fewer diffusers. For ceiling heights below 9′, it is advisable to reduce the CFM per diffuser to a minimum and use more diffusers.

## Grilles and Registers

Unlike ceiling diffusers, grilles and registers have a comparatively low induction rate. The air stream moving in just one direction induces room air into the primary stream which means room air must be replaced by non-induced room air. This causes a counterflow residual air movement about equal to terminal velocity. As ideal residual air motion is 50 FPM or less, terminal velocity should not exceed 50 FPM and grilles should be sized on that basis.

When selecting grilles and registers, keep these points in mind:

**1.** The throw from a straight-flow grille varies with the square root of the core area of the grille and with the face velocity.

**2.** The ratio of height to width has no appreciable effect on the distance of the throw from grilles where the ratio is less than 25:1.

**3.** If air streams from a grille are converged, it results only in reducing the effective area of the grille.

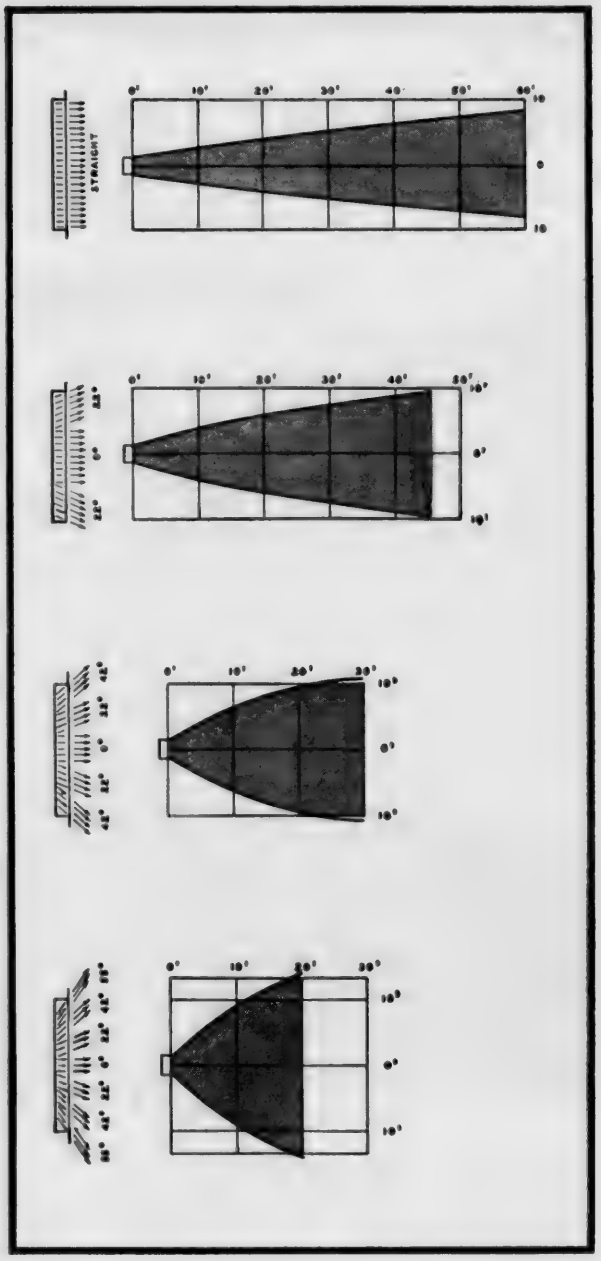
**4.** Breaking the air stream into jets has no effect on the rate of mixing or the throw.

**5.** Deflecting the air stream by turning the vanes outward to increase the spread, shortens the throw, depending on the degree of deflection.

**6.** The drop for a given throw varies about inversely as the face velocity for an air stream below room temperature and varies directly as the temperature differential.

In locating grilles, it is important to visualize the air patterns which various deflection settings produce. The patterns illustrated at right are based on a 24″ x 6″ grille. Grilles should be spaced so that edges of the streams from adjacent grilles do not meet before the stream has traversed over 50% of the required throw, otherwise undue turbulence in the occupied zone will result.

## Air Patterns Produced by Typical Deflection Settings



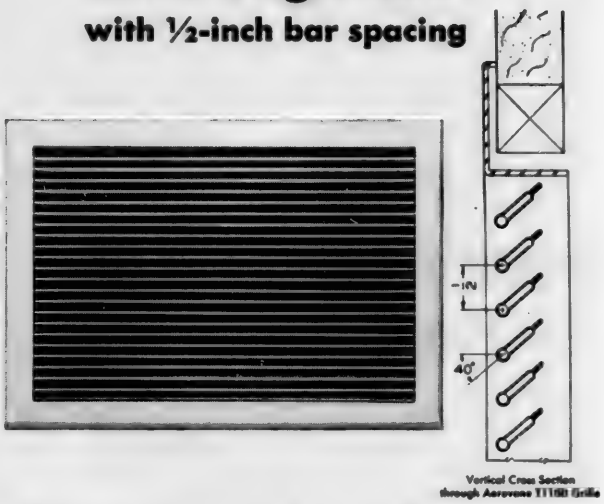

If you have a specific problem involving air distribution, Tuttle & Bailey's Engineering Department will welcome the opportunity to be of help. Address: R. D. Tutt, Chief Engineer, Tuttle & Bailey, New Britain, Connecticut.

# NEW PRODUCT NEWS from T&B

## Aerovane

### return air grilles and registers

**with ½-inch bar spacing**



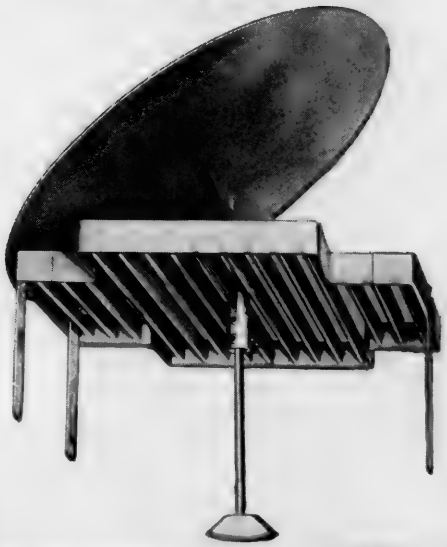

Vertical Cross Section through Aerovane T110D Grille

This new design for the Aerovane line features horizontal bars set at an angle of 40° on ½-inch centers . . . a modern, streamlined appearance that virtually eliminates objectionable see-through. Aerovane T110D Grille is illustrated above . . . Aerovane T117D Register combines grille and adjustable opposed blade damper unit.

For full information, write for Bulletin 201.

## No. 6 Type TFD

### volume control damper insures positive, quiet operation



Designed for use with T&B AEROFUSE Ceiling Diffusers where short coupled connections are required. Unit consists of a single blade damper hinged to an adjustable bar grid. Damper setting is regulated through the face of the diffuser by means of an operator handle and rod which may be kept permanently in place or used as a removable key.

For full information, write for Bulletin 112.

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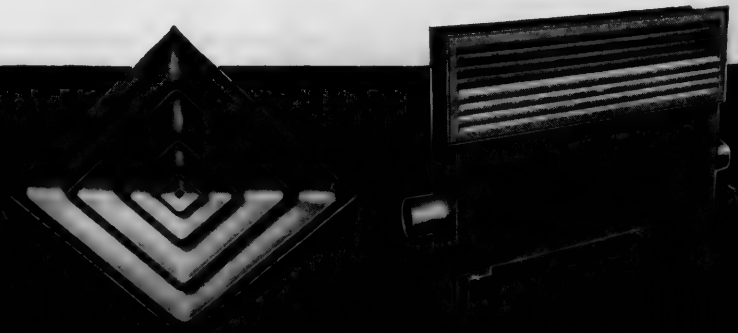

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*Contractor:* Raisler Corp., New York, N. Y.

**UNIVERSITY OF NEBRASKA LINCOLN, NEBRASKA**
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*Architect:* Hazen & Robinson, Lincoln, Neb.
*Contractor:* Ray Martin Co., Lincoln, Neb.

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*Architect:* Eggers & Higgins, New York, N. Y.
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*Architect:* Voorhees, Walker, Smith & Smith, New York, N. Y.
*Contractor:* Alvord & Swift, New York, N. Y.

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*Architect:* Dreyfus, Seiferth & Gibert, New Orleans, La.
*Contractor:* James F. O'Neil, New Orleans, La.

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*Architect:* Same
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* * * * *

**In the exact words you have just read** we introduced "Sam" to the heating field . . . more years ago than most of you can recall. We repeat those words because we believe some of us have come to take Sam for granted — have forgotten his *BASIC* message.

Of course "you know the rest of THAT story," but do you *tell* the story? It's the basic reason for boiler feeders and low water cut-offs. It's a story that has a tremendous selling wallop because it *IS* basic and true. It's a story that TODAY has greater selling power than ever before . . . *in both* the *steam* and *hot water* heating fields.

In a word, it's the story of boiler SAFETY . . . and remember: when safety is at stake only the most dependable safety devices are good enough!

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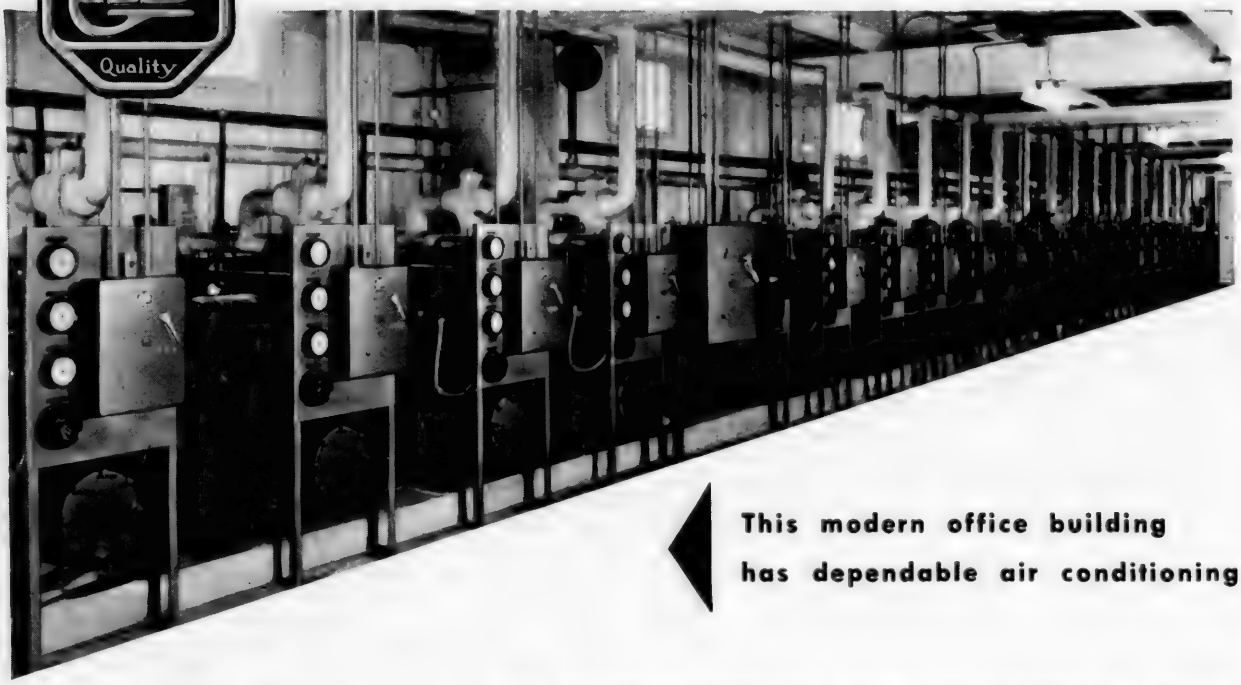
**230 series** ASME pressure relief valves for hot water space heating boilers; for hot water tanks and heaters. Tested and Btu-rated by National Board of Boiler and Pressure Vessel Inspectors. Also temperature relief valves and P-T relief valves.

# McDONNELL *Boiler Water Level Controls*

*Your Jobber Stocks Them*

THE SIGN OF QUALITY MOTOR CONTROL

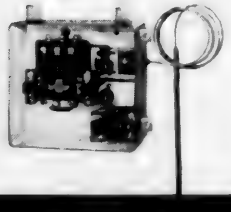


This modern office building has dependable air conditioning

**TYPICAL ALLEN-BRADLEY CONTROL UNITS FOR AIR CONDITIONING & REFRIGERATION**

**Bulletin 712 Combination Starter** with new visible contact disconnect switch.

**Temperature Control Panel**



## . . . all compressors are equipped with

# ALLEN-BRADLEY

## TROUBLE FREE MOTOR CONTROLS

The importance of "trouble free" operation is well recognized by air-conditioning and refrigeration equipment manufacturers. This is illustrated in the above picture which shows 20 of 41 air-conditioning compressors installed in a new office building . . . all equipped with Allen-Bradley controls.

The basic simplicity of Allen-Bradley solenoid starters is the reason for their outstanding reliability . . . there is only ONE moving part. No bearings or gimmicks to corrode and stick . . . no jumpers to break. The double break, cadmium silver alloy contacts never need cleaning, filing, or dressing . . . maintenance down time is eliminated, and so are "service calls." Dependable overload relays that maintain their accuracy indefinitely protect motors against burnout.

Specify Allen-Bradley "Quality" motor control . . . you will never have reason to regret your decision. Please write for your copy of the latest Allen-Bradley Handy Catalog, the 132-page guide to trouble free a-c and d-c motor control.

Allen-Bradley Co.
1330 S. Second St., Milwaukee 4, Wis.
In Canada—
Allen-Bradley Canada Ltd., Galt, Ont.

Jenni Genetron says:

Buy from your genetron wholesaler displaying this clock!

# IT'S ALWAYS THE RIGHT TIME FOR genetron® Super-Dry Refrigerants

**genetron 11** ORANGE LABEL
TRICHLOROMONOFLUOROMETHANE

**genetron 12** WHITE LABEL
DICHLORODIFLUOROMETHANE

**genetron 141** GREEN LABEL
MONOCHLORODIFLUOROMETHANE

**genetron 226** PURPLE LABEL
TRICHLOROTRIFLUOROETHANE

**genetron 320** DARK BLUE LABEL
DICHLOROTETRAFLUOROETHANE

Wherever you are—from coast to coast—there's a "genetron" wholesaler as close to you as your telephone. When you order refrigerants, always ask for "genetron" super-dry refrigerants!

*Basic Chemicals for American Industry*

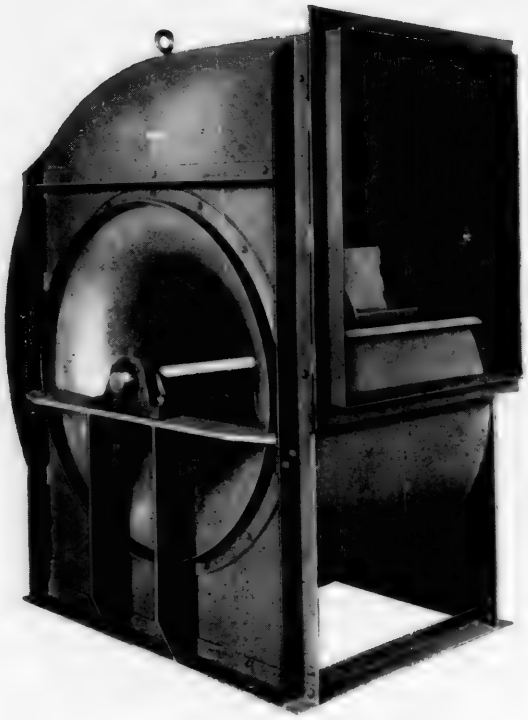
**GENERAL CHEMICAL DIVISION**
ALLIED CHEMICAL & DYE CORPORATION
**40 Rector Street, New York 6, N. Y.**

GC Allied Chemical

# nyb

# centrifugal fans...

## STANDARD AND HEAVY DUTY



### Skillfully Engineered, Accurately Rated, Feature Heavy Welded Steel Construction

Two types of fan wheels. Housing dimensions remain the same but performance characteristics differ.

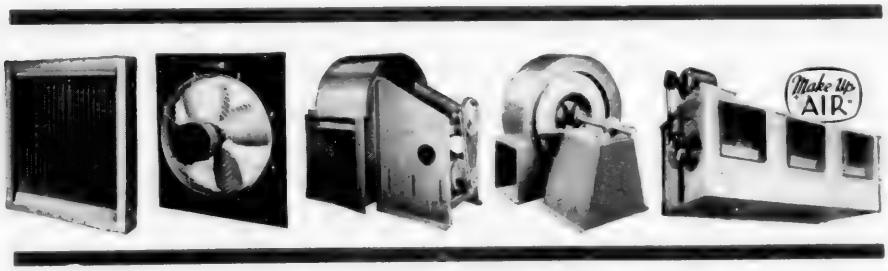
Forward Curve wheels offered from 7½ to 73 inch. Capacities up to 70,000 cfm.

Quiet operating, medium speed (IPL) wheels with non-overloading horsepower characteristics for heating, ventilating and air conditioning or industrial applications. Wheel diameters from 15 inch to 73 inch, with any speed or discharge required. Capacities up to 123,000 cfm. Class I, II, or III construction.

All-welded housing featured as standard construction for simplicity, extra strength and rigidity—dust tight and leak proof. Bolted (knock-down) type available in Class I and Class II. Split housing can be furnished as extra if required.

*Write for Bulletins 544 and 561*

**nyb** products have 65 years of manufacturing experience and engineering knowledge built into them. All **nyb** products are laboratory tested, accurately rated and fully guaranteed in strict accordance with standard test codes.




**When working on your air handling problems, consult the *nyb* representative nearest you in our nationwide service or write for bulletins.**

**nyb** **THE NEW YORK BLOWER COMPANY**

SALES OFFICES • 3165 SOUTH SHIELDS AVENUE • CHICAGO 16

FACTORY, LAPORTE, INDIANA

This internationally-known research institute uses 1900 Glasfloss Fiber Glass Air Filters every three months to prevent dust build-up in electrostatic precipitators. Perfect atmosphere is needed to assure proper results in the many phases of research tests.

# Glasfloss Air Filters help control atmosphere, lower air conditioning costs at world-famous research institute

More than 1900 Pittsburgh Glasfloss Air Filters are used every three months in the air conditioning system at this famous eastern research center to prevent dust build-up on electrostatic precipitators.

"Pittsburgh Glasfloss Filters help catch dust, prevent over-loading the electrostatic precipitators, lower maintenance costs through reduction of the number of times necessary for cleaning or flushing, and lessen the power load," reports the institute's director of engineering.

"Perfect air conditioning is a must at the institute, since we are devoted to long-range research of the effects of industrial techniques upon human welfare. We must control the atmosphere in order not to interfere with results of study on such subjects as air pollution, public health, sanitation and alleviation of industrial hazards. The fact that Pittsburgh Glasfloss Air Filters are constantly used in our air conditioning system speaks for itself."

### GLASFLOSS FILTERS CAN GIVE YOU TOP SERVICE, TOO!

Pittsburgh Glasfloss Air Filters are made from fine, soft fiber glass which provides a greater, more efficient dust-collecting area, yet does not interrupt the flow of air. Glasfloss Filters are soft and easy to handle; this fiber glass does not splinter or pierce the skin.

Get top results from your heating and air conditioning systems with Glasfloss Filters. Try them once, and you'll buy them always! For the name of your local Glasfloss Distributor, call your nearest sales office, or write *Pittsburgh Plate Glass Company, Fiber Glass Division, One Gateway Center, Pittsburgh 22, Pennsylvania.*

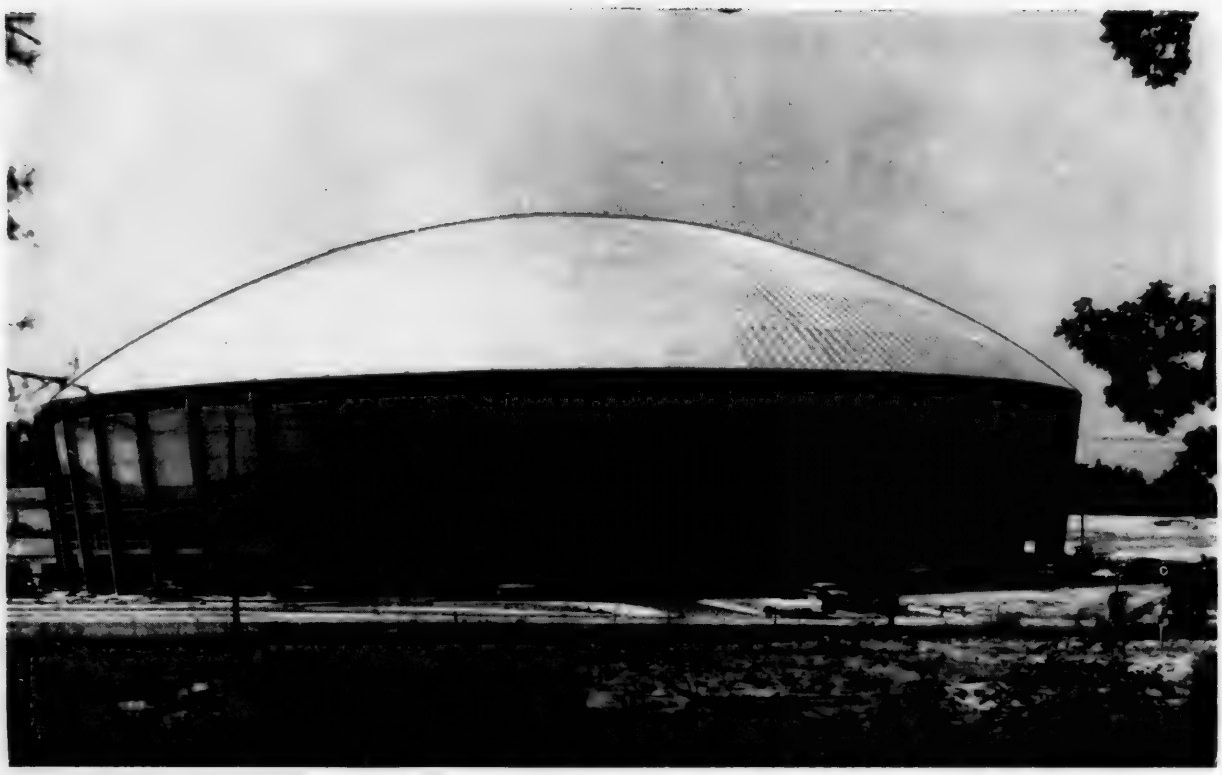
**PITTSBURGH GLASFLOSS FILTERS ARE A PRODUCT OF THE FIBER GLASS DIVISION OF PITTSBURGH PLATE GLASS COMPANY**

Sales Offices are located in the following cities: Charlotte, Chicago, Cincinnati, Cleveland, Detroit, Houston, Los Angeles, New York, Philadelphia and St. Louis

FIBER PG GLASS

**PAINTS • GLASS • CHEMICALS • BRUSHES • PLASTICS**

PITTSBURGH PLATE GLASS COMPANY



# Marlo Heats and Ventilates Huge New Coliseum

Comfort conditioning the cavernous interior of this new 13,500-seat coliseum in Charlotte, N. C., is a man-size job. The huge aluminum dome, easily the world's largest at more than 332 feet in diameter, covers an area of two acres.

Heating and ventilating this unusual structure is accomplished by 22 Marlo Ceiling Units, with a combined capacity of 336,800 cubic feet per minute.

The building was designed by architect A. G. Odell, Jr. General contractor was Thompson & Street Co., mechanical contractor was Hopkins, Hicks and Ingle, and engineer was Mechanical Engineers, Inc., all of Charlotte.

One of the 22 Marlo heating and ventilating units suspended from the roof structure of the new coliseum.

**Consult your Architect or Engineer—or write today for more detailed information on these and other Marlo Air Conditioning Units.**

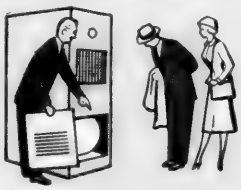
# MARLO coil co.

SAINT LOUIS 10, MISSOURI

**Quality Air Conditioning and Heat Transfer Equipment Since 1925**

QUIETER TURNOVER HERE . . .

GIVES YOU QUICKER TURNOVER HERE . . .



RCR Type

RCSM Type

# *SUPER QUIET* FAFNIR BALL BEARING RUBBER CYLINDRICAL CARTRIDGES

for
air conditioning
and
heating equipment

**FAFNIR**
*SUPER QUIET*
**RA-PP TYPE**
**BALL BEARING**

Balls and races specially finished for super-quiet performance.

Extended inner ring for greater shaft support.

Self-locking collar for easiest assembly . . . securely locks bearing to shaft with mere twist of wrist.

Patented Plya-Seals that positively keep dirt out, lubricant in. Bearing is pre-lubricated with correct amount of long-life, factory-filtered grease. Relubrication is never required.

SEND FOR THIS six-page bulletin containing detailed information, including dimensions and load ratings, of Fafnir's complete line of super-quiet ball bearings and rubber-cushioned ball bearing units.

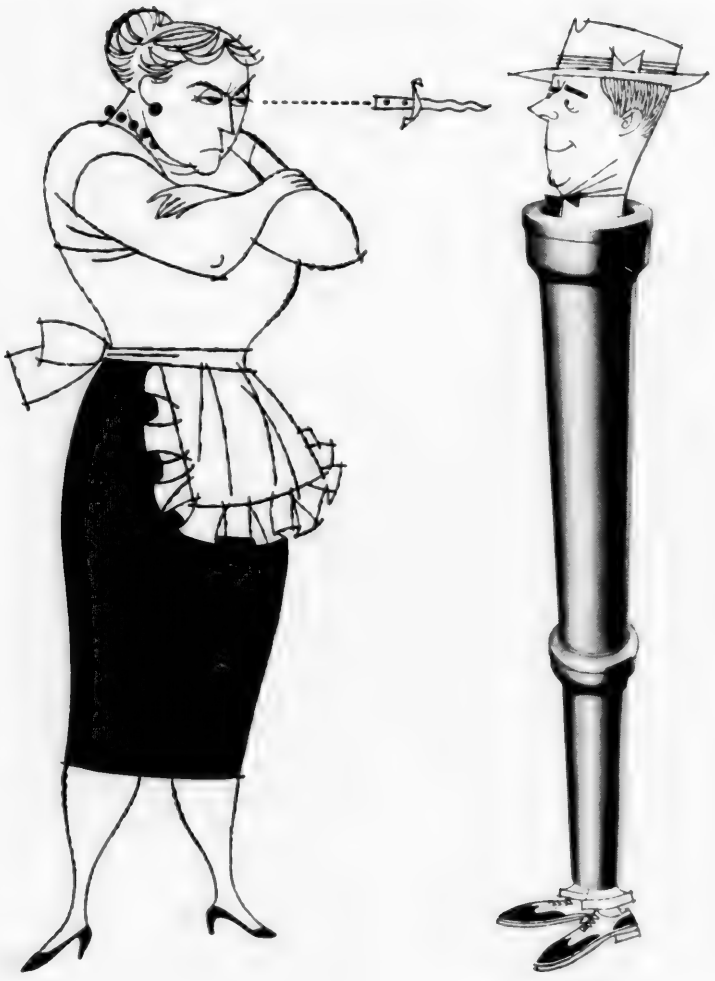
Super-quiet, maintenance-free performance, plus low cost and superior design features make these Fafnir Ball Bearing Units an excellent, economical choice for household air conditioning equipment — or for any equipment where quieter operation can increase sales appeal and customer satisfaction.

Fafnir Rubber Cylindrical Cartridges are equipped with RA-PP Type Super-Quiet Ball Bearings. These bearings feature balls and races specially-finished for extra-silent service. They are pre-packed with long-life lubricant, factory-filtered to reduce friction, wear, and noise, and to extend bearing life. Housed in electric current-conducting rubber grommets, they require no metallic grounding springs or clips.

Fafnir RCSM TYPE CARTRIDGES are specifically designed to interchange with other makes of ball bearing rubber-cushioned cartridges, while RCR TYPE CARTRIDGES, available in sizes to fit standard type sleeve bearing brackets, make replacement of ordinary sleeve bearing mountings easy and economical. Write for detailed information and specifications. The Fafnir Bearing Company, New Britain, Conn.

**FAFNIR**
**BALL BEARINGS**
MOST COMPLETE LINE IN AMERICA

RESISTS
CORROSIVE
ATTACK



(PRACTICALLY ALL VARIETIES)

## DURIRON® ACIDPROOF DRAIN PIPE

Duriron is the one high quality high silicon iron drain line material that architects and engineers have specified with confidence for more than thirty years.

For permanent corrosion resistance when handling all acids and other commonly encountered corrosives, specify and insist upon DURIRON.

A complete stock of Duriron pipe and fittings is carried by leading wholesalers in principal cities.

DURIRON
LOOK FOR THE NAME ON EVERY PIECE

**THE DURIRON COMPANY, INC. | DAYTON, OHIO**

# GUARANTEED TO END AIR TROUBLE

## IN HOT WATER HEATING SYSTEMS

**GUARANTEE**

**B & G Airtrol Systems are guaranteed to prevent the accumulation of air in heating units and prevent noises caused by entrained air in the piping. In case of the failure of any B & G Airtrol System (within the U. S. A.) to operate correctly, when installed in accordance with our published instructions, we will provide, free of charge, the services of a factory-trained engineer who will supervise the changes required to produce satisfactory results.**

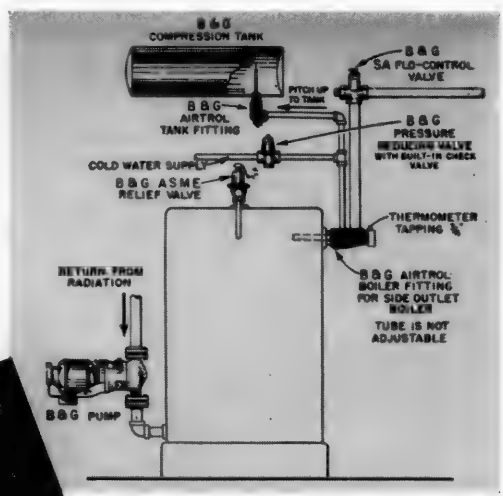
The B & G Airtrol Side Outlet Boiler Fitting is made in four sizes to fit a wide range of boilers.

Failure to heat—gurgling in the piping and heating units—waterlogged compression tanks...these common troubles can be charged to *air in the system!* And charged also on your books as the reason for profitless call-backs!

It's easy now to get rid of air troubles for good—with a B & G Airtrol System on every hot water job. Tested and proved in thousands of installations, this patented B & G product eliminates air accumulation in forced hot water heating systems—*solves a problem never before satisfactorily answered.*

The B & G Airtrol System consists of two simple, easily installed parts, the Boiler Fitting and the Tank Fitting. Their combined function is to trap air in the compression tank and prevent its return to the boiler, piping and heat distributing units. All air bubbles are caught where they form—*in the boiler!*

Remember, the B & G Airtrol System is the only *guaranteed* method of controlling air in hot water heating systems.

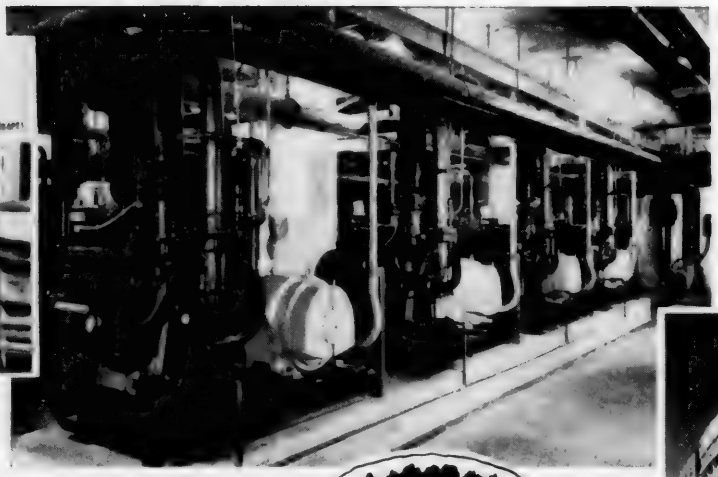

B&G COMPRESSION TANK
B&G SA FLO-CONTROL VALVE
PITCH UP TO TANK
B&G AIRTROL TANK FITTING
B&G PRESSURE REDUCING VALVE WITH BUILT-IN CHECK VALVE
COLD WATER SUPPLY
B&G ASME RELIEF VALVE
THERMOMETER TAPPING
RETURN FROM RADIATION
B&G AIRTROL BOILER FITTING FOR SIDE OUTLET BOILER
TUBE IS NOT ADJUSTABLE
B&G PUMP

*Typical installation of B & G Airtrol System on side outlet boiler.*

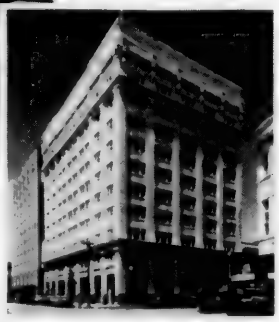
**For complete information, send for Bulletin No. HM-456**

**BELL & GOSSETT**
**COMPANY**
**Dept. EN-4, Morton Grove, Illinois**
*Canadian Licensee: S. A. Armstrong, Ltd., 1400 O'Connor Drive, Toronto, Canada*

Frick unit air conditioners are built in 3, 5 and 7½ horsepower sizes.



Eight Frick "ECLIPSE" compressors, each with nine cylinders, air condition both the 11-story buildings of the American National Insurance Co. in Galveston, Texas.



TRADE FRICK MARK®

# Air Conditioning and Refrigeration

## The Industry's Most Complete Engineering Service

Including surveys, sales-engineering, design, manufacture, shipment, installation, and maintenance.

Built into Frick equipment are 50 years' experience in air conditioning, 74 in refrigeration, and 103 in engineering. Nowhere else can you get this combination of unique engineering experience, complete systems and complete service—on any commercial or industrial cooling load, with any refrigerant, at any temperature!

Branches and distributors the world over: write for literature and estimates today.

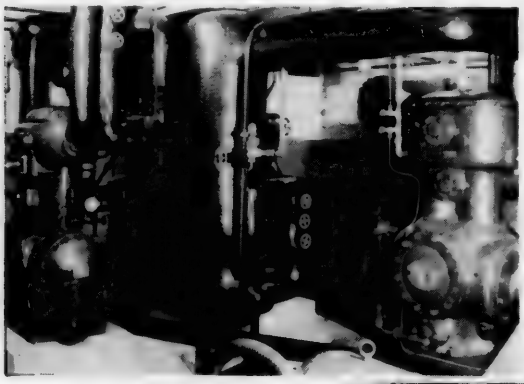
DEPENDABLE REFRIGERATION SINCE 1882

FRICK CO.

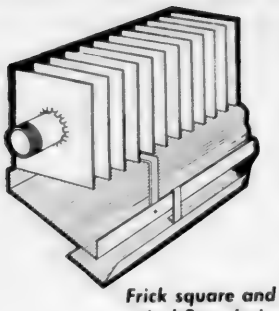
WAYNESBORO, PENNA. U.S.A.

Fragmented Shell-Ice is produced automatically: plants making block ice available in any size.

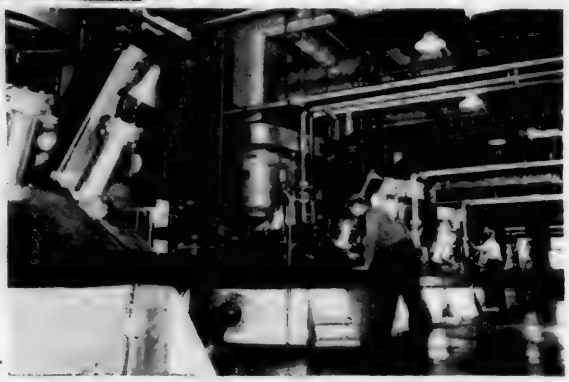
Below: Ammonia booster systems save power on quick-freezing work.



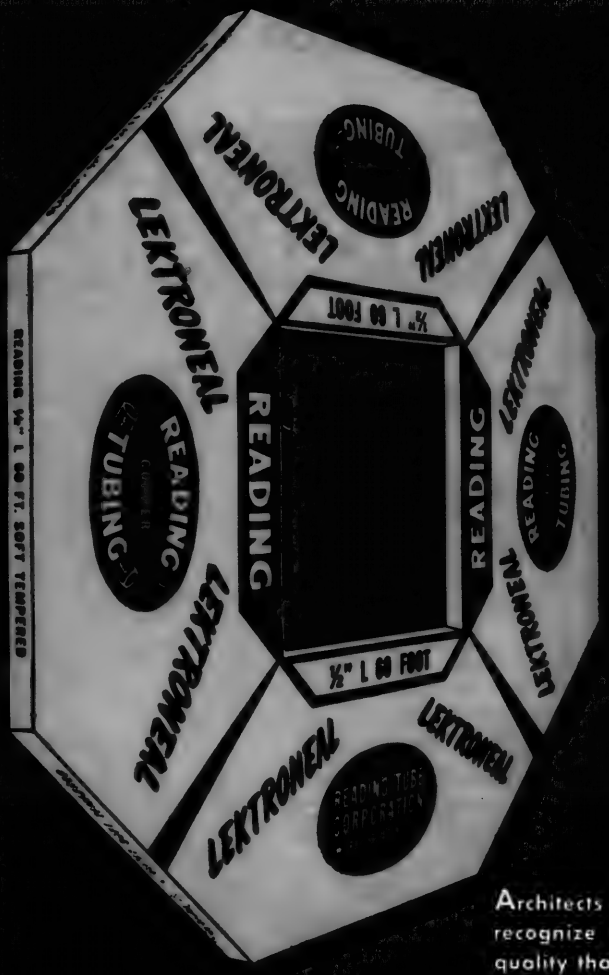
Synthetic-rubber reactors handle batches over twice as fast when cooled with patented Frick coils.



Frick square and spiral finned pipes save valuable space.

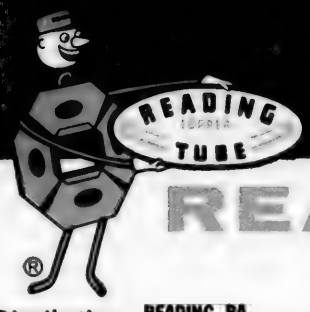


In writing for literature, please describe the cooling work you wish to do.




# Something MORE than Copper Tube goes into this easy to handle package!

Architects . . . Builders . . . Contractors have come to recognize the "Readi-Pak!" carton as a symbol for quality that can be depended upon to help them build good will, as well as their business. They know, too, that it stands for *Personal Service*—the *big plus* that makes the *Big Difference* at Reading—streamlined, "Shirt-Sleeve" Service . . . from our top brass on down . . . service that eliminates delays and speeds delivery, from mill to distributor to contractor. It's a symbol for Copper Tube made by "Specialists" in the industry—because Reading makes tubing, and *only* tubing, in one of America's most modern, completely integrated mills. By specializing, we can deliver a better product to you—a product you will be proud to deliver too. Next time you are in need of Copper Tube, specify *Reading* Copper Tube and discover the BIG DIFFERENCE

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# Complete Motor Line

multi-speed

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gear motors

## ... plus quality and service

As part of a national network of more than 200 franchised outlets, your nearby Allis-Chalmers Motor Distributor offers the rare combination of *fast service* and a *complete line* of *fine-performance* integral horsepower motors. He's the right man to give you just the right motor — in a hurry.

**It adds up to:**

**1. Simplified Buying** — Here's one source for all motors from 1 to 200 hp, as close as your telephone. Single source trims clerical costs, minimizes purchasing and accounting expenditures.

**2. Reduced Inventory** — You don't have to tie up funds and warehouse space with spare motors and replacement parts. The A-C Distributor is your motor storehouse.

**3. Continuous Production** — Your A-C Distributor can deliver a motor to your shop in a matter of hours. (And, once you order an A-C motor, you're sure of 'round-the-calendar operation.)

GET ACQUAINTED with your Allis-Chalmers Motor Distributor soon. You can find out his name by contacting the A-C sales office in your area, or write Allis-Chalmers, General Products Division, Milwaukee 1, Wisconsin.

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ALLIS-CHALMERS

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A-5187

# *The thermostat on the wall—*

## *puts comfort at his fingertips*

IF HE wants to, the man at the desk can sit there all day and enjoy *complete comfort!*

If he prefers a change in temperature, the adjustment indicator is at eye-level—and within easy reach of his fingertips.

This is *deskside temperature control.* The key to the whole system is the thermostat on the wall—the Honeywell Round.

*Thermostatic control is automatic—all year.* There's no manual on-off operation with resulting cycle of too-hot, too-cool. No more tiresome, inconvenient adjustments of switches and valves. It provides uniform comfort both winter and summer.

*Thermostatic control is sensitive.* The thermostat is a precision instrument; it maintains a set temperature accurately.

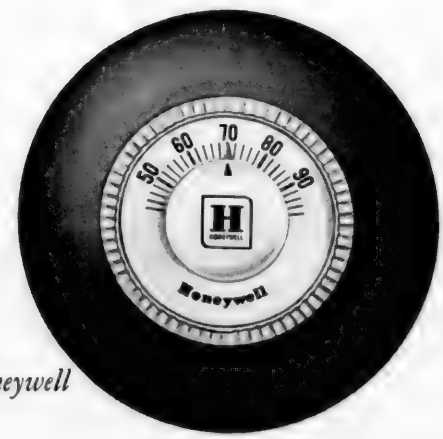
*Thermostatic control is convenient.* Unlike switch or valve types of heating control, the thermostat is always conveniently located. Changing a setting is easy and sure.

For complete information and help in selecting thermostatic controls for your clients, call your nearest Honeywell office.

For more details on the Honeywell Round, write Honeywell, Dept.HV-10-121,Minneapolis 8, Minn.

MINNEAPOLIS **Honeywell**

First in Controls

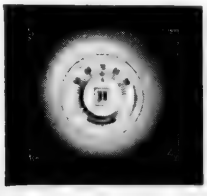



*The Honeywell Round*

*The thermostat that was styled with modern architecture in mind*

The popular Honeywell Round is the first truly *new* design in years. Made in pneumatic, electric, and electronic models for accurate, economical control of heating or cooling in hospitals, apartments, offices, schools, industrial buildings, hotels, motels and homes.

Practical! Ruggedly designed, yet it's precision-built for long service.



Easy to use! Setting and checking are simplified by one easy-to-read scale.

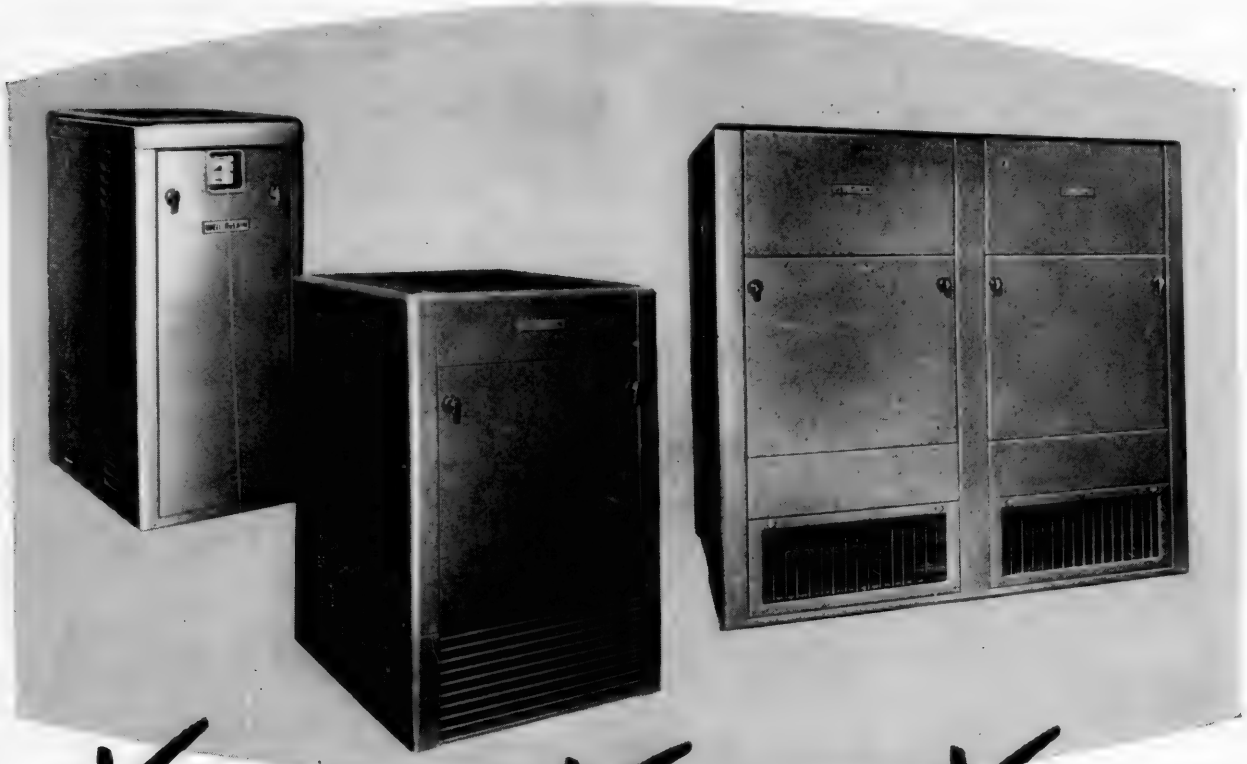
# ✓ CHECK THE *Extra Values*

## IN THIS COMPLETE LINE OF CAST IRON GAS BOILERS

These gas boilers are worth your critical appraisal... you'll find many advanced engineering and efficiency features which explain why it is easier and more profitable to sell Weil-McLain *Extra Values.* In this full line, the reputation of Weil-McLain Boilers for overall efficiency, operating economy and durability is fully sustained.

Weil-McLain Gas Boilers are *cast iron,* to assure long life under the conditions encountered in gas-firing. They burn all gases, including LP. All units are built to ASME Code requirements, approved by AGA and I-B-R rated.

For complete information, send for literature on Weil-McLain *Extra Value* Gas Boilers.



✓ **TYPE G**

**For hot water heating systems. A.G.A. input BTU/Hr. from 76,000 to 225,000.**

**Design highlights:** Ribbon-type burners ...individual water-backed, finned flues for balanced gas travel and rapid heat transfer ... factory-assembled controls located high on the boiler...easily cleaned...installs on any type of floor ...delivered with sections and base assembled for quick installation...complete fibre glass insulation.

✓ **TYPE H**

**For hot water and steam. A.G.A. input BTU/Hr. from 120,000 to 540,000.**

**Design highlights:** Sections have extra large heating surface, studded for greater heat absorption...large top supply tapping assures easier installation, better circulation and dry steam...provision for high capacity domestic water heater ...dual pilot orifice minimizes "linting" ...short draw-rods simplify erection... completely insulated with fibre glass.

✓ **TYPE J**

**For hot water and steam. A.G.A. input BTU/Hr. from 625,000 to 5,000,000.**

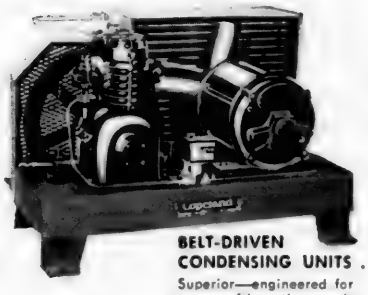
**Design highlights:** Large water volume for longer steaming period, high residual heat...extra large flow tappings and nipples assure low steam velocity... quiet, high flame temperature ribbon burner...multiple short draw-rods for simplified erection...removable jacket panels give complete access for easy cleaning...fibre glass insulated.

**WEIL-McLAIN** MICHIGAN CITY, INDIANA

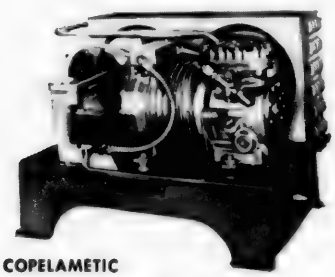
WEIL-McLAIN BOILERS · RADIATORS

**Address literature requests to Dept. BB-106**

**COPELAWELD**
Heavy duty performance at low current consumption.



**BELT-DRIVEN CONDENSING UNITS . . .**
Superior—engineered for every refrigeration need.



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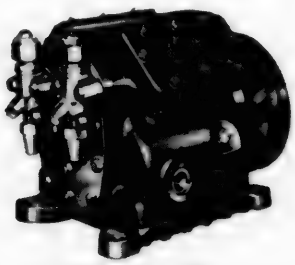

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Designed for the critical needs of truck and auto air conditioning and refrigeration.

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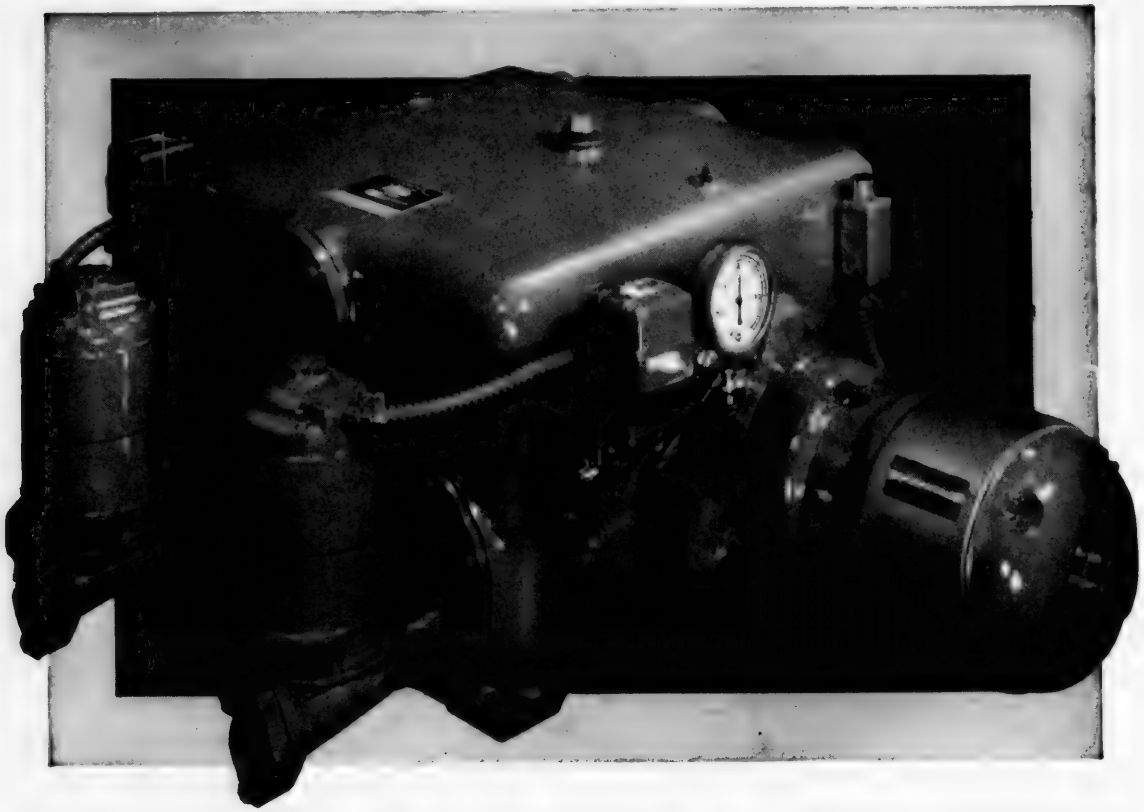
OVER 500 manufacturers of quality display cases, coolers and air conditioners as well as truck fleet operators and automobile makers now use Copeland compressors and condensing units original and replacement equipment. The hundreds of thousands of units now in operation are evidence of Copeland's ruggedness, economy and dependability . . . and good reason why industry turns to Copeland for the advanced design and engineering necessary to an expanding air conditioning and refrigeration market.

WRITE FOR SPECIFICATION AND PERFORMANCE DATA

SINCE 1918 **Copeland** REFRIGERATION CORPORATION,

*Sidney, Ohio*

# THIS NEW VACUUM HEATING PUMP IS SIZED TO ACTUAL JOB REQUIREMENTS



## *It's the Nash* CSM

No longer is it necessary for the Engineer to accept a vacuum heating pump with air and water capacities based inflexibly upon square feet of equivalent direct radiation. With the flexible Nash CSM he can provide for proper air capacity in accordance with his judgment and experience. For the individual capacities of the separate pumps on the CSM may be varied within a wide range, without buying an oversize receiver and oversize water pumps.

These pumps possess many other features which permit a more efficient utilization of fuel and minimum use of electric power. Low, low, returns reduce installation costs and usually eliminate putting the pump in a pit. Simplicity and efficient operation reduce supervision and maintenance costs. Information regarding this new heating pump development is available immediately upon request.

- Increased air capacity induces rapid system response without wasteful overheating.
- Separate air and water pumps individually selected to meet actual job requirements.
- Control system that operates individual pumps only when needed.
- Flexibility permitting addition of radiation without changing basic pump installation.
- Low, low, return line connection.

**NASH ENGINEERING COMPANY**
**438 WILSON, SO. NORWALK, CONN.**

**Condensed information and specification data are presented for packaged water chillers. Most of these units present a means for air conditioning through the use of fan-coil-filter units installed in offices and other buildings. Many types of packaged water chillers available are illustrated. This is Part I of a two-part article.**

PACKAGED water chillers which are now available in a large variety of models, have a number of uses, although the application of interest to the air conditioning engineer is the means to cool water circulated to fan-coil-filter units for year-round air conditioning. In this way a liquid type heating system can tie in with an air conditioning system without the necessity of installing special ducts. Specification data covering fan-coil-filter units was presented by this author as an article in the December, 1955 issue of AIR CONDITIONING, HEATING AND VENTILATING.

Specification data on available standard packaged water chilling units and condensed, unbiased information on units up to 100 hp in size are covered in this article.

Packaged water chillers are complete refrigeration systems used to chill water for air conditioning, for process cooling, or wherever cold water is desired. They are used as a source of cooling for air conditioning systems in multi-room buildings such as houses, hotels, motels, apartments, hospitals, office buildings, schools and country clubs. In these applications the chillers are usually used in conjunction with fan-coil-filter units which may be free standing floor units, recessed wall units or ceiling mounted units.

In shopping centers or multi-zoned buildings, packaged chillers may be used to supply several floor mounted or suspended air conditioning units made up of a fan section, a water coil section and a filter section and connected to a duct air distribution system. They are also connected to water coils in built up systems or to coils in residential duct systems.

Water chillers are used for cooling mixers in bakeries, in rubber mills, and in chemical plants. Chilled water is often necessary or helpful in the cooling of welding tips of spot welders. This provides a better more uniform bond which can mean fewer rejects and the machine can operate continuously for a longer time. Better precision machine work may be possible with controlled coolant temperature. Controlled temperature chilled water may be necessary in various chemical, pharmaceutical and food processing applications, also in plastic molding, and in plating or anodizing. The smallest units are used in self-contained drinking water coolers.

Many chillers are adaptable to direct chilling of not

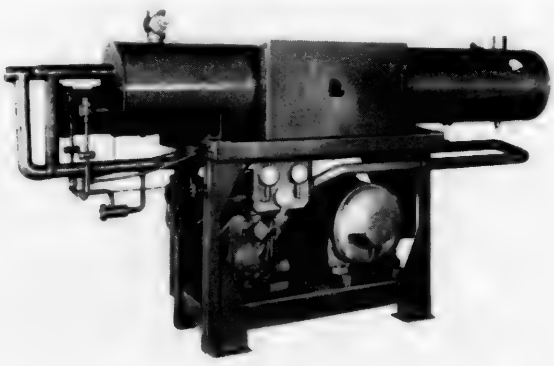


Fig. 1. Acme Flow Therm packaged liquid chiller, LD or C series.

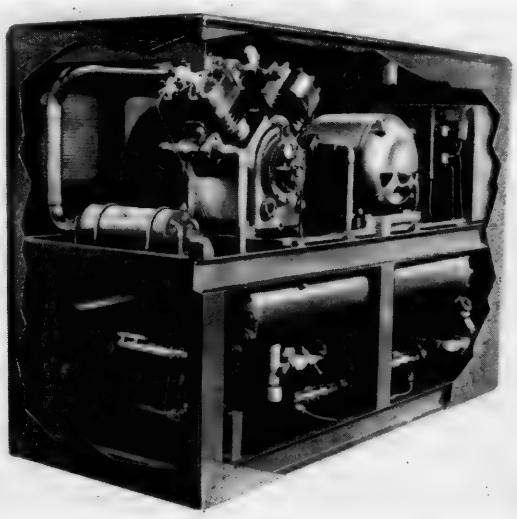


Fig. 2. (Right) Bell and Gossett Co., encased water chiller with belt driven compressor.

TABLE I—SPECIFICATION DATA FOR PACKAGED WATER CHILLERS

| Make | Model No. | Compressor | | Refrigerant | | Chiller | Pump, Hp | Condenser |
|---|---|---|---|---|---|---|---|---|
| | | Hp | Type | Type | Flow Control | Type | Outlet, In | Type |
| Acme Industries, Inc. | RE-3 | 3 | Accessible hermetic | F-22 | Capillary tube | Copper tubes rolled into steel tube sheet aluminum star shaped insert | 1 — 1/3 | Integral finned copper coil |
| | RE-5 | 5 | | | | | 1 1/4 — 1/3 | |
| | RE-8 | 7 1/2 | | | | | 1 1/2 — 1/2 | |
| | RE-10 | 10 | | | | | 1 1/2 — 1/2 | |
| | RE-15 | 2-7 1/2 | | | | | 1 1/2 — 3/4 | |
| | RE-20 | 2-10 | | | | | 2 — 1 1/2 | |
| | LD-20 | 20 | V-belt drive | F-22 | | Copper tubes with aluminum star inserts | 2 — None | Integral finned copper tubes |
| | LD-25 | 25 | | | | | 2 1/2 | |
| | LD-30 | 30 | | | | | 2 1/2 | |
| | LD-40 | 40 | | | | | 3 | |
| | LD-50 | 50 | | | | | 3 | |
| | LD-60 | 60 | | | | | 4 | |
| | LD-75 | 75 | | | | | 4 | |
| | LD-100 | 100 | | | | | 5 | |
| American Coils Co. | AC 1-A 30 | 3 | Semi-hermetic, field serviceable | F-12 | | | 3/4 | |
| | AC 1-A 50 | 5 | | F-12 | | | 3/4 | |
| | AC 1-A 75 | 7 1/2 | | F-12 | | | 1 1/4 | |
| | AC 1-A 100 | 2-5 | | F-12 | | | 2 3/4 | |
| | AC 1-A 150 | 2-7 1/2 | | F-12 | | | 2 4 | |
| American Radiator & Standard Sanitary Corp. | PAS-2 AC | 2 | Hermetic | F-22 | Capillary tube | | 1 | Copper tubes, a. fins-air cooled |
| | PAS-3 AC | 3 | | F-22 | | | | |
| | PAS-2 | 2 | | F-22 | | | | Copper tube in tube |
| | PAS-3 | 3 | | F-22 | | | | |
| | ACS-8 | 7.5 | V-belt drive | F-12 | Thermostatic expansion valve | Copper tube | 1 1/2 — None | Integral finned copper tube |
| | ACS-10 | 10 | | F-12 | | | 1 1/2 | |
| | ACS-15 | 15 | | F-12 | | | 2 | |
| | ACS-20 | 20 | | F-12 | | | 2 | |
| | ACS-25 | 25 | | F-12 | | | 2 1/2 | |
| | ACS-30 | 30 | | F-12 | | | 2 1/2 | |
| | ACS-40 | 40 | | F-22 | | | 2 1/2 | |
| | ACS-50 | 50 | | F-22 | | | 3 | |
| | ACS-60 | 60 | | F-22 | | | 4 | |
| | ACS-75 | 75 | | F-22 | | | 4 | |
| Auburn Burner Co. | C-2-CW | 2 | Hermetic | F-22 | | Copper and brass | 3/4 — None | Cleanable tubes |
| | C-3-CW | 2 | | F-22 | | | 1 | |
| | 5-CW | 5 | | F-22 | | | | |
| | C-2-CA | 3 | | F-22 | | | 3/4 | Air cooled |
| | C-3-CA | 3 | | F-22 | | | 1 | |
| Bell and Gossett Co. | PLC-7 1/2 | 7 1/2 | V-belt drive | F-12 | Thermal expansion valve | U-bend removable tube bundle | 2 — 1/2 | Finned copper tubes |
| | PLC-10 | 10 | | F-12 | | | 2 — 1/2 | |
| | PLC-15 | 15 | | F-12 | | | 2 — 1/2 | |
| | PLC-20 | 20 | | F-12 | | | 2 1/2 — 3/4 | |
| | PLC-25 | 25 | | F-12 | | | 3 — 3/4 | |
| | PLC-30 | 30 | | F-12 | | | 3 — 3/4 | |
| | PLC-40 | 40 | | F-12 | | | 3 — 3/4 | |
| | PLC-50 | 50 | | F-12 | | | 3 — 1 1/2 | |
| Borg-Warner Corp. | 200 C | 2 | Hermetic | F-22 | | Tube in tube | 1 — None | Cleanable tube |
| | 300 C | 3 | | F-22 | | | 1 | |
| | 501 CW | 5 | | | Capillary | Copper tubes | 1 1/4 | Tube in tube |
| | 201 CAR | 2 | | F-22 | Expansion valve | Tube in tube | 1 | Air cooled |
| | 301 CAR | 3 | | F-22 | | | 1 | |
| Carrier Corp. | 30 E-5 | 5 | Accessible hermetic | F-12 | | Copper tube bundle | 1 1/4 — 1/4 | |
| | 30 E-8 | 7 1/2 | | F-22 | | | 1 1/2 — 1/2 | |
| | 30 E-10 | 10 | | F-22 | | Copper tubes | 1 1/2 — 1/2 | |
| | 30 E-15 | 2-7 1/2 | | F-22 | | | 1 1/2 — 3/4 | |
| | 30 E-20 | 2-10 | | F-22 | | | 2 — 1 1/2 | |
| | 30 D-25 | 25 | Direct drive | G-141 or F-22(1) | Thermal expansion valve | Non-ferrous tubes, direct expansion | 2 1/2 | Integral finned copper tubes |
| | 30 D-40 | 40 | | | | | 2 1/2 | |
| | 30 D-60 | 60 | | | | | 2 1/2 | |
| | 30 D-75 | 75 | | | | | 3 | |
| | 30 C-100 | 100 | | | Float valve | Integral fins, flooded | 4 | |
| | 30 C-100 | 100 | | | | | 5 | |
| Chrysler Corp. | SW 1303 | 3 | Direct drive radial motor sealed in crank case | F-22 | | Inner finned tubes | 1 1/2 | Shell and coil |
| | SW 1305 | 5 | | F-12 | | | 2 | |
| | SW 1308 | 7 1/2 | | F-22 | | | 2 | |
| | SW 1311 | 10 | | F-22 | | | 2 1/2 | |
| | SW 1315 | 15 | | F-22 | | | 2 1/2 | |
| | W 312 | 15 | Radial direct drive | F-12 | Expansion valve | Dry expansion, shell and coil | 2 — None | Finned U-tubes |
| | W 312H | 15 | | F-12 | | | 2 1/2 | |
| | W 512 | 25 | | F-12 | | | 2 1/2 | |
| | W 512H | 25 | | F-12 | | | 2 1/2 | |
| | W 712 | 40 | | F-12 | | | 2 1/2 | |
| | W 712H | 40 | | F-12 | | | 3 | |
| | W 322 | 25 | | F-22 | | | 2 1/2 | |

**USED AS PART OF YEAR-ROUND AIR CONDITIONING SYSTEM**

| Outlet, In. | Size of Unit, Inches: Length | Width | Height | Weight, Pounds: Shipping | Operator | Control | Factory Charged |
|---|---|---|---|---|---|---|---|
| 1¾ | 45½ | 24⅜ | 36¾ | 850 | | On-off | |
| 1 | 67⅛ | 24⅜ | 36¾ | 980 | | On-off | |
| 1¼ | 67⅛ | 26⅜ | 38⅝ | 1150 | | On-off | |
| 1¼ | 68½ | 26⅞ | 45 | 1410 | | On-off | |
| 1½ | 93⅝ | 29 | 53½ | 2060 | | On-off | |
| 1½ | 93⅝ | 29 | 58 | 2550 | | On-off | |
| 2 | 133¾ | 32¼ | 60 | | | Step control by cylinder unloading, 25-50-75% or 33-50-67% | |
| 2 | 122½ | 32¼ | 62⅞ | | | Step control by cylinder unloading, 25-50-75% or 33-50-67% | |
| 2 | 134⅞ | 32¼ | 64⅜ | | | Step control by cylinder unloading, 25-50-75% or 33-50-67% | |
| 3 | 137⅜ | 39½ | 70½ | | | Step control by cylinder unloading, 25-50-75% or 33-50-67% | |
| 3 | 161⅞ | 39½ | 70½ | | | Step control by cylinder unloading, 25-50-75% or 33-50-67% | |
| 3 | 126⅛ | 42 | 70¾ | | | Step control by cylinder unloading, 25-50-75% or 33-50-67% | |
| 3 | 141⅞ | 53¾ | 84 | | | Step control by cylinder unloading, 25-50-75% or 33-50-67% | |
| 3 | 191⅛ | 53¾ | 84⅜ | | | Step control by cylinder unloading, 25-50-75% or 33-50-67% | |
| 1 | 35¼ | 25½ | 32 | | | On-off | |
| 1 | 44¾ | 26¾ | 32 | | | On-off | |
| 1 | 51 | 30¼ | 34 | | | On-off | |
| 2-1 | 57 | 30¼ | 43½ | | | Two step | |
| 2-1 | 57 | 30¼ | 43½ | | | Two step | |
| | 30 | 24 | 47 1/16 | 418 | | On-off | Yes |
| | 34 | 28 | 49 1/16 | 530 | | On-off | Yes |
| ¾ | 23¼ | 17¾ | 26 1/16 | 251 | | On-off | Yes |
| ¾ | 23¼ | 17¾ | 26 1/16 | 310 | | On-off | Yes |
| 1½ | 64 | 26 | 48½ | 1740 | | Step control by cylinder unloading | Yes |
| 2 | 78½ | 32 | 54 | 1960 | | Step control by cylinder unloading | Yes |
| 2 | 102½ | 38 | 65 | 3050 | | Step control by cylinder unloading | Yes |
| 2½ | 129 | 38 | 65 | 3800 | | Step control by cylinder unloading | Yes |
| 2½ | 116 | 38 | 80¼ | 4095 | | Step control by cylinder unloading | Yes |
| 3 | 140¾ | 38 | 80¼ | 4815 | | Step control by cylinder unloading | Yes |
| 3 | 146⅛ | 38 1/16 | 77⅜ | 5360 | | Step control by cylinder unloading | Yes |
| 3 | 133 | 40 5/16 | 80⅛ | 5840 | | Step control by cylinder unloading | Yes |
| 3 | 174⅛ | 41½ | 85⅞ | 7125 | | Step control by cylinder unloading | Yes |
| 4 | 148½ | 49¾ | 89¾ | 7920 | | Step control by cylinder unloading | Yes |
| ½ | 23¼ | 17¾ | 26 | 275 | | On-off | Yes |
| ½ | 23¼ | 17¾ | 26 | 315 | | On-off | Yes |
| | | | | 555 | | On-off | Yes |
| | | | | 445 | | On-off | Yes |
| | | | | 515 | | On-off | Yes |
| 1 | 80 | 29 | 46 | 1792 | 1892 | On-off | Yes |
| 1 | 80 | 29 | 46 | 1973 | 2073 | 2-step | Yes |
| 1¼ | 86 | 40 | 52 | 3336 | 3436 | 2-step | Yes |
| 1½ | 86 | 40 | 65 | 3977 | 4077 | 3-step | Yes |
| 1½ | 90 | 40 | 65 | 4175 | 4275 | 3-step | Yes |
| 1½ | 102 | 40 | 65 | 4505 | 4605 | 3-step | Yes |
| 2 | 102 | 44 | 68 | 5440 | 5540 | 3-step | Yes |
| 2½ | 120 | 44 | 70 | 6530 | 7330 | 3-step | Yes |
| ¾ | 23¼ | 17¾ | 27 1/16 | 249 | | On-off | Yes |
| ¾ | 23¼ | 17¾ | 27 1/16 | 304 | | On-off | Yes |
| 1 | 33 | 20 | 32 1/16 | 431 | | On-off | Yes |
| | 23¼ | 17¾ | 27 5/16 | 231 | | On-off | Yes |
| | 23¼ | 17¾ | 27 5/16 | 280 | | On-off | Yes |
| 1 | 67⅛ | 24¼ | 33¾ | 1050 | 960 | On-off | Yes |
| 1¼ | 66½ | 26⅜ | 38½ | 1375 | 1270 | On-off | Yes |
| 1¼ | 68¼ | 26⅞ | 42 | 1420 | 1310 | On-off | Yes |
| 1½ | 93⅝ | 29 | 53½ | 2060 | 1830 | Two compressors | Yes |
| 2-1¼ | 93⅝ | 29 | 55½ | 2560 | 2335 | Two compressors | Yes |
| 1½ | 88⅜ | 26¼ | 67¼ | 3360 | 3800 | Step control by cylinder cut out | Yes |
| 2 | 101¾ | 27¼ | 73⅛ | 4640 | 5265 | Step control by cylinder cut out | Yes |
| 2½ | 146¼ | 31 | 77⅜ | 5585 | 6475 | Step control by cylinder cut out | Yes |
| 4 | 157¼ | 29¾ | 83½ | 5680 | 6980 | Step control by cylinder cut out | Yes |
| 5 | 162⅛ | 63¾ | 70⅛ | 8625 | 9655 | Step control by cylinder cut out | Yes |
| 5 | 161¼ | 63¾ | 70⅛ | 9565 | 10630 | Step control by cylinder cut out | Yes |
| ¾ | 46 | 19⅜ | 49⅛ | 540 | 520 | On-off | Yes |
| 1 | 49 | 19⅜ | 48¾ | 930 | 900 | On-off | Yes |
| 1 | 49 | 19⅜ | 48¾ | 1150 | 1120 | On-off | Yes |
| 1¼ | 58⅞ | 28⅛ | 51 | 1250 | 1210 | On-off | Yes |
| 1¼ | 58⅞ | 28⅛ | 51 | 1360 | 1320 | On-off | Yes |
| 2 | 118 | 39 | 75 | 3900 | | Cylinder unloading | No |
| 2 | 130 | 39 | 77¼ | 4500 | | Cylinder unloading | No |
| 2 | 130 | 39½ | 77¼ | 5050 | | Cylinder unloading | No |
| 2 | 142 | 39½ | 79¼ | 5400 | | Cylinder unloading | No |
| 2 | 142 | 41¼ | 79¼ | 5900 | | Cylinder unloading | No |
| 3 | 154 | 41¼ | 83¼ | 6700 | | Cylinder unloading | No |
| 2 | 130 | 39½ | 77¼ | 4600 | | Cylinder unloading | No |

only water but of brines, kerosene, machine tool coolants, cutting oils, and other fluids.

Most units have a freeze-up protection thermostat, but this feature should be checked on each unit. It usually consists of a thermal bulb installed in the leaving water

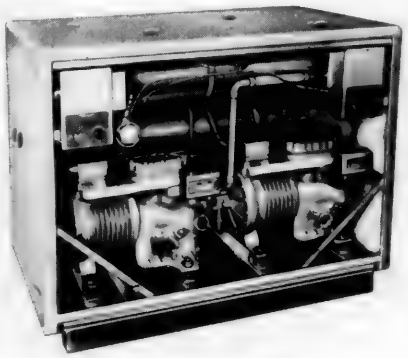


Fig. 3. American Coils Co., water chiller with two 7½ hp hermetic compressors.

circuit from the chiller and opens the compressor electric circuit if the water temperature gets too low.

Advantages of packaged chillers include the fact that all the refrigerant piping is done on a factory production line. This includes dehydrating the system and usually charging it with refrigerant. Only chilled water piping, condenser water piping, and electric wiring have to be done in the field at the site of the installation.

Note that the majority of the units use reciprocating

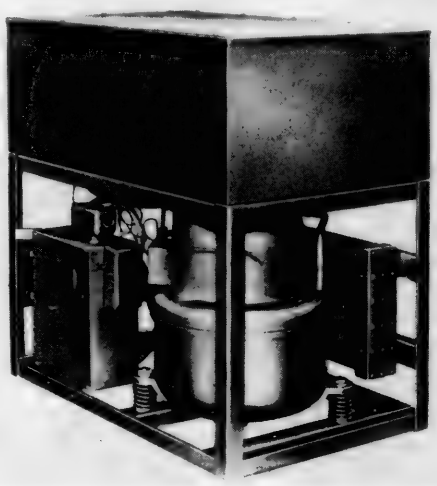


Fig. 4. Borg-Warner Corp., air cooled water chiller with 5 hp hermetic compressor.

compressors of either hermetic, direct drive, or belt drive types. The exceptions are the Trane Company hermetic centrifugal compressor and the Servel, Inc. steam absorption unit.

Following are brief features of units mentioned in the extensive tabulation:

*Acme Industries, Inc.* (Fig. 1). In the small size

TABLE I (CONTINUED)—SPECIFICATION DATA FOR PACKAGED WATER CHILLERS

| Make | Model No. | Compressor | | Refrigerant | | Chiller | | Pump, Hp | Condenser |
|---|---|---|---|---|---|---|---|---|---|
| | | Hp | Type | Type | Flow Control | Type | Outlet, In | | Type |
| Chrysler Corp. (continued) | W 322H | 25 | Radial direct drive | F-22 | Expansion valve | Dry expansion, shell and coil | 2½ | None | Finned U-tubes |
| | W 522 | 40 | | F-22 | | | 2½ | | |
| | W 522H | 40 | | F-22 | | | 4 | | |
| | W 722 | 60 | | F-22 | | | 3 | | |
| | W 722H | 60 | | F-22 | | | 4 | | |
| | W 812 | 40 | | F-12 | | | 2½ | | |
| | W 812H | 40 | | F-12 | | | 3 | | |
| | W 1012 | 50 | | F-12 | | | 3 | | |
| | W 1012H | 50 | | F-12 | | | 4 | | |
| | W 1212 | 60 | | F-12 | | | 3 | | |
| | W 1212H | 60 | | F-12 | | | 4 | | |
| | W 1412 | 75 | | F-12 | | | 4 | | |
| | W 1412H | 75 | | F-12 | | | 4 | | |
| | W 822 | 75 | | F-22 | | | 4 | | |
| | W 822H | 75 | | F-22 | | | 4 | | |
| | W 1022 | 100 | | F-22 | | | 4 | | |
| | W 1022H | 100 | | F-22 | | | 4 | | |
| | W 1222 | 100 | | F-22 | | | 4 | | |
| | W 1222H | 100 | | F-22 | | | 4 | | |
| Coleman Co., Inc. | 6006 | 1¾ | Hermetically sealed | F-22 | Expansion valve | Shell and coil | 1⅛ | Not given | Air mist copper coil |
| | 6007 | 3 | | F-22 | | | 1⅜ | | |
| | 6008 | 5 | | F-22 | | | | | |
| Combustion Engineering | 200 | 2 | Hermetic | | | Tube in tube | 1 | Not given | Water cooled |
| | 300 | 3 | | | | | 1 | | |
| Cool-Ette, Inc. | WC 2 | 2 | Hermetic | F-22 | Capillary tube | Copper tube in tube | 1 | None | Double tube, cleanable |
| | WC 3 | 3 | | F-22 | | | 1 | | |
| | WC 5 | 5 | | F-22 | | | 1¼ | | |
| | WCA 2 | 2 | | F-22 | Expansion valve | | 1 | | Air cooled |
| | WCA 3 | 3 | | F-22 | | | 1 | | |
| Curtis Mfg. Co., Refrigeration Div. | 7C 12 | 7½ | Belt driven | F-22 | Expansion valve | Internally finned copper tubes, steel shell | 2 | None | Lo-fin copper tubes, cleanable, in steel tube sheets |
| | 7C 14 | 7½ | | | | | 2 | | |
| | 7C 15 | 7½ | | | | | 2½ | | |
| | 7C 18 | 7½ | | | | | 2 | | |
| | 10C 13 | 10 | | | | | 2½ | | |
| | 10C 18 | 10 | | | | | 2 | | |
| | 10C 23 | 10 | | | | | 2 | | |
| | 15C 20 | 15 | | | | | 2½ | | |
| | 15C 23 | 15 | | | | | 2 | | |
| | 15C 30 | 15 | | | | | 2 | | |
| | 20C 24 | 20 | | | | | 2½ | | |
| | 20C 26 | 20 | | | | | 2 | | |
| | 20C 28 | 20 | | | | | 2 | | |
| | 20C 29 | 20 | | | | | 2 | | |
| | 20C 32 | 20 | | | | | 2 | | |
| | 25C 30 | 25 | | | | | 2 | | |
| | 25C 31 | 25 | | | | | 2 | | |
| | 25C 34 | 25 | | | | | 3 | | |
| | 25C 37 | 25 | | | | | 2½ | | |
| | 25C 38 | 25 | | | | | 2½ | | |
| | 30C 35 | 30 | | | | | 2½ | | |
| | 30C 36 | 30 | | | | | 2½ | | |
| | 30C 37 | 30 | | | | | 3 | | |
| | 30C 41 | 30 | | | | | 2½ | | |
| | 40C 39 | 40 | | | | | 2½ | | |
| | 40C 40 | 40 | | | | | 3 | | |
| | 40C 41 | 40 | | | | | 2½ | | |
| | 40C 43 | 40 | | | | | 2½ | | |
| | 50C 42 | 50 | | | | | 2½ | | |
| | 50C 44 | 50 | | | | | 4 | | |
| | 50C 46 | 50 | | | | | 3 | | |
| | 50C 51 | 50 | | | | | 3 | | |
| | 60C 47 | 2-30 | | | | | 4 | | |
| | 60C 48 | 2-30 | | | | | 3 | | |
| | 60C 49 | 2-30 | | | | | 3 | | |
| | 60C 50 | 2-30 | | | | | 4 | | |
| | 60C 52 | 2-30 | | | | | 3 | | |
| | 80C 54 | 2-40 | | | | | 4 | | |
| | 80C 55 | 2-40 | | | | | 5 | | |
| | 80C 57 | 2-40 | | | | | 4 | | |
| | 80C 61 | 2-40 | | | | | 4 | | |
| | 100C 56 | 2-50 | | | | | 4 | | |
| | 100C 58 | 2-50 | | | | | 4 | | |
| | 100C 59 | 2-50 | | | | | 4 | | |
| | 100C 60 | 2-50 | | | | | 4 | | |
| | 100C 62 | 2-50 | | | | | 6 | | |
| | 100C 63 | 2-50 | | | | | 5 | | |

(1) For Model 30 C 100, the refrigerant is C-7. For all other Models it is either G-141 or F-22.

**USED AS PART OF YEAR-ROUND AIR CONDITIONING SYSTEM**

| Outlet, In | Size of Unit, Inches: Length | Width | Height | Weight, Pounds: Shipping | Operator | Control | Factory Charged |
|---|---|---|---|---|---|---|---|
| 2 | 142 | 39½ | 79¼ | 4800 | | | |
| 2 | 142 | 39½ | 79¼ | 5800 | | | |
| 3 | 154 | 39½ | 87¼ | 7050 | | | |
| 3 | 142 | 41¼ | 83¼ | 6850 | | | |
| 4 | 156 | 41¼ | 90½ | 8250 | | | |
| 2 | 142 | 41¼ | 81¼ | 7050 | | | |
| 3 | 154 | 41¼ | 85¼ | 7950 | | | |
| 2 | 142 | 42¼ | 83¼ | 8300 | | | |
| 3 | 157 | 42¼ | 89¼ | 9550 | | Cylinder unloading | No |
| 3 | 142 | 42¼ | 85¼ | 9100 | | | |
| 4 | 170 | 42¼ | 92½ | 10450 | | | |
| 3 | 130 | 42¼ | 89¼ | 10250 | | | |
| 4 | 147 | 42¼ | 96½ | 11700 | | | |
| 3 | 154 | 42¼ | 89¼ | 9000 | | | |
| 4 | 154 | 42¼ | 92½ | 9850 | | | |
| 3 | 132 | 42¼ | 89¼ | 9400 | | | |
| 4 | 147 | 42¼ | 96½ | 10900 | | | |
| 4 | 170 | 42¼ | 92½ | 10900 | | | |
| 4 | 170 | 42¼ | 96½ | 12650 | | | |
| | 51½ | 29 | 50½ | 625 | | | |
| | 51½ | 29 | 50½ | 650 | | On-off | Yes |
| | 57½ | 29 | 50½ | 760 | | | |
| | 17¾ | 23¼ | 26 | 280 | | On-off | |
| | 17¾ | 23¼ | 26 | 308 | | | |
| ¾ | 20¼ | 27¼ | 29¾ | 250 | | | |
| ¾ | 20¼ | 27¼ | 29¾ | 290 | | | |
| ¾ | 22½ | 37 | 36¾ | 500 | | On-off | Yes |
| | 24 | 30 | 47 | | | | |
| | 28 | 34 | 49 | | | | |
| | 88 | 26¼ | 54 | 1725 | 1505 | | |
| | 100 | 26¼ | 54 | 1785 | 1560 | | |
| | 100 | 26¼ | 54 | 1785 | 1560 | | |
| | 112 | 26¼ | 54 | 1845 | 1620 | | |
| | 98 | 31⅝ | 60 | 2170 | 1780 | | |
| | 110 | 31⅝ | 60 | 2195 | 1830 | | |
| | 146 | 31⅝ | 60 | 2340 | 1975 | | |
| | 134 | 31⅝ | 60 | 2500 | 2070 | | |
| | 146 | 31⅝ | 60 | 2550 | 2120 | | |
| | 170 | 31⅝ | 60 | 2660 | 2225 | | |
| | 146 | 31⅝ | 60 | 2720 | 2270 | | |
| | 158 | 31⅝ | 60 | 2780 | 2330 | | |
| | 158 | 31⅝ | 60 | 2780 | 2380 | | |
| | 170 | 31⅝ | 60 | 2840 | 2380 | | |
| | 182 | 31⅝ | 60 | 2910 | 2430 | | |
| | 173 | 39½ | 68⅞ | 3585 | 3125 | | |
| | 184 | 39½ | 68⅞ | 3650 | 3180 | | |
| | 139⅛ | 39½ | 70⅞ | 3740 | 3260 | | |
| | 151⅛ | 39½ | 70⅞ | 3830 | 3340 | | |
| | 163⅛ | 39½ | 70⅞ | 3920 | 3425 | | |
| | 151⅛ | 39½ | 70⅞ | 3820 | 3385 | | |
| | 151⅛ | 39½ | 70⅞ | 3820 | 3385 | Cylinder cutout capacity regulation | Yes |
| | 151⅛ | 39½ | 70⅞ | 3815 | 3380 | | |
| | 175⅛ | 39½ | 70⅞ | 3980 | 3540 | | |
| | 163⅛ | 39½ | 70⅞ | 4660 | 4180 | | |
| | 163⅛ | 39½ | 70⅞ | 4660 | 4180 | | |
| | 175⅛ | 39½ | 70⅞ | 4760 | 4250 | | |
| | 187⅛ | 39½ | 70⅞ | 4830 | 4345 | | |
| | 187⅛ | 39½ | 70⅞ | 4930 | 4505 | | |
| | 140¾ | 39½ | 73 | 5000 | 4575 | | |
| | 152¾ | 39½ | 73 | 5120 | 4685 | | |
| | 176¾ | 39½ | 73 | 5330 | 4890 | | |
| | 152¾ | 43⅞ | 84¾ | 8335 | 7935 | | |
| | 164¾ | 43⅞ | 84¾ | 8500 | 8120 | | |
| | 164¾ | 43⅞ | 84¾ | 8500 | 8120 | | |
| | 164¾ | 43⅞ | 84¾ | 8500 | 8120 | | |
| | 188¾ | 43⅞ | 84¾ | 8860 | 8490 | | |
| | 159⅛ | 43⅞ | 84¾ | 9540 | 9140 | | |
| | 159⅛ | 43⅞ | 86¾ | 9540 | 9140 | | |
| | 171⅛ | 43⅞ | 86¾ | 9691 | 9291 | | |
| | 195⅛ | 43⅞ | 86¾ | 9994 | 9594 | | |
| | 195⅝ | 43⅞ | 86¾ | 10120 | 9720 | | |
| | 207⅝ | 43⅞ | 86¾ | 10269 | 9869 | | |
| | 219⅝ | 43⅞ | 86¾ | 10425 | 10025 | | |
| | 219⅝ | 43⅞ | 86¾ | 10425 | 10025 | | |
| | 185¼ | 43⅞ | 88 | 10444 | 10044 | | |
| | 197¼ | 43⅞ | 88 | 10638 | 10238 | | |

*(Table to be continued)*

units of the RE series, there is a single circuit with components which include muffler, heat exchanger, solenoid valve, thermal expansion valve, refrigerant charging valve, filter drier, liquid line shut-off valve. For the 15 and 20 hp size there are two circuits with these components in both circuits. Larger sizes, available in the LD model, permit a wide range of combinations to permit matching equipment to system.

*American Coils Co.* (Fig. 3). The 10 and the 15 hp models have two separate chillers. All units are completely

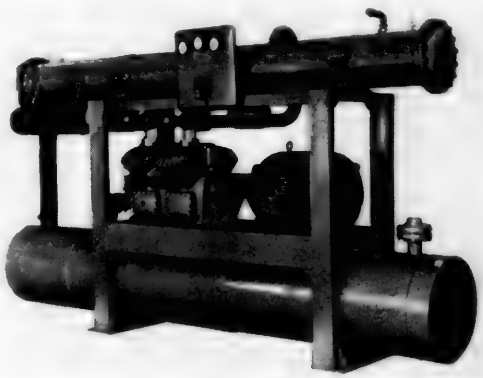


Fig. 5. Carrier Corp., packaged chiller for the capacity range of 25 to 100 hp.

enclosed in a cabinet and fully wired so that only power and water connections are necessary. Water valves and pumps are not supplied.

*American Radiator & Standard Sanitary Corp.* The PAS series, available in 2 and 3 hp sizes, have hermetically sealed refrigerant units with a steel framework enclosing and supporting a motor-compressor assembly, condenser and evaporator with capillary tubes for refrigerant flow control. ACS models come in sizes from 7½ to 75 hp and these packaged units require only connection of the chilled water lines, the condenser water lines, and simple electrical connections. Compressor-motor assembly consists of a multi-cylinder, enclosed, single acting Freon compressor driven by a high torque motor through a multi-V-belt drive. Forced feed lubrication is installed for units of 40 to 75 hp capacity.

*Auburn Burner Co.* All water cooled condensers, that are part of the packaged assembly, are of the mechanically cleanable type. Water cooled systems are equipped with water valve bellows, hi-low cut out and freeze control.

*Bell & Gossett Co.* (Fig. 2). Unit has a completely wired control panel box and all controls are interlocked. Requires only a power supply and disconnect switch. Refrigeration compressor is located on top of packaged cooler; oil and refrigerant are prevented from running into crankcase while unit is not in operation.

*Borg-Warner Corp.* (Fig. 4). Evaporator is encased in vapor-proof insulated steel cabinet attached to the compressor frame. Tecumseh compressors are used.

*Carrier Corp.* (Fig. 5). For the series *E* units, compressor is of hermetic design similar to that used in the

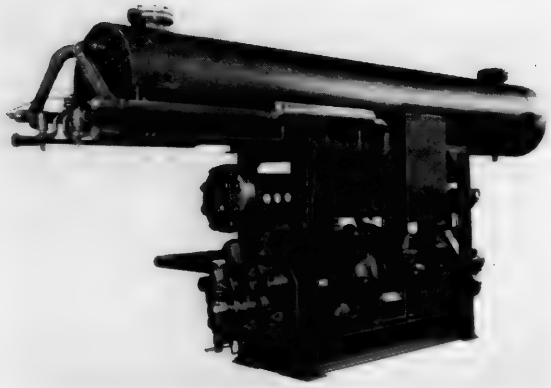


Fig. 6. Chrysler Corp., water chiller with twin radial compressor direct driven by one motor. Similar models in sizes from 15 to 125 hp.

self-contained Weather-maker units. They have automatically reversible oil pumps. The *C* and *D* series have heavy duty compressors with a built-in capacity control system actuated by suction pressure. Design of the direct expansion unit is adaptable to a wide range of application requirements. Three types of baffle spacing in the water circuit permit a selection range with reasonably constant pressure drop through the cooler for any given cooling range and water circulated. Cooler is insulated with rock cork and is fitted with refrigerant and water connections.

*Chrysler Corp.* (Fig. 6). Wired into the control panel are overload protection for the compressor motor, freeze protection thermostat, control thermostat and interlock relay for the chilled water pump. A permanent type dehydrator-strainer and liquid indicator are standard equipment. Chiller is a high capacity type with a single refrigerant pass with direct expansion of refrigerant in the tubes. All connections to compressor, including suction line, are made with flexible couplings. In sizes from 3 to 15 hp chiller is a single refrigerant pass type with direct expansion of refrigerant in the tubes. For the larger sizes, it is the dry expansion type with a low refrigerant operating charge, 3 inches of rock cork insulation laid in asphalt and covered with a steel jacket. Large size assembly consists of Airtemp radial compressor with motor, water cooled condenser-receiver, insulated dry expansion liquid chiller, heat exchanger, structural steel stand, line valves, gages with panel board, solenoid and expansion valves complete.

*Cool-Ette, Inc.* A Tecumseh hermetic reciprocating type compressor is used. Refrigerant condenser is the double tube counter flow type. Units can be furnished for 220-volt single or 3-phase power sources.

*Curtis Refrigerating Machine Division of Curtis Manufacturing Co.* Compressor is slow speed type equipped with tapered roller main bearings. Motor is of high starting torque, low starting current type with multiple V-belt drive. Feature of downward feed refrigerant through the chiller is said to assure complete oil return to compressor. Refrigerant suction line and manifold piping completely insulated to prevent condensation.

( *To be continued*)

## Room Air Distribution for Year-round Air Conditioning

Some interesting things about air distribution within a room during year-round air conditioning were learned as the result of a study conducted at the University of Illinois and sponsored by the university and the American Gas Association.

Data were obtained for selecting the proper types of supply outlets at floor, baseboard and side wall locations only, which would give satisfactory air distribution in residential rooms during all seasons of the year. In this study, air temperature and air velocities were measured at 231 stations in the room for each different experimental arrangement. In spite of the fact that studies with almost 100 different experimental arrangements were conducted with the various outlets, only four distinct groups of room air patterns were obtained. Conclusions arrived at from this study follow:

No single type of outlet provided optimum air distribution for year-round air conditioning.

During heating, the most acceptable distribution was obtained from outlets which were located in or near the floor and directed the air horizontally across the floor, or which directed the air vertically with considerable spread. The latter type gave acceptable performance over a wide range of flow rates and supply air velocities.

During cooling, the most acceptable distribution was obtained from outlets which were located near the ceiling and discharged the air horizontally, or from outlets located in or near the floor which directed the air vertically with little spread.

During year-round air conditioning, if more importance were to be attached to the heating performance, a preferred outlet would be that which introduces the air vertically, with considerable spread, from a position in or near the floor. If more importance were to be attached to the cooling performance, a preferred outlet would be that which introduces the air vertically, with little spread. from a position in or near the floor or one which introduces the air horizontally from a position near the ceiling. It should be realized that the preferred outlet for one season will only be a compromise for another.

The fact that a given type of outlet is preferred for heating or cooling does not imply that the other types of outlets cannot be used to give satisfactory performance. With such other outlets, many factors involved in the design of a system need more careful consideration than when the preferred outlet is used. For example, neither the supply air velocities nor the flow rates can be varied over the wide range permissible with the preferred outlet.

During heating or cooling, if an outlet produced uniform temperature distribution with little stratification, the location of the return intake had only a limited effect on the distribution. Under these conditions, the performance of a system with a single return intake would be practically the same as for a multiple return system, but the installation would be greatly amplified.

A full report of the study and the results obtained are presented in Engineering Experiment Station Bulletin No. 435 for sale by the University of Illinois, Urbana, Ill.

# Calculating the Heat Requirements of a Snow Melting System

## Part 2—West Central Rocky Mountain Region

WILLIAM P. CHAPMAN

**This article, one of a series planned to cover eventually all those important regions of the U. S. where snow melting systems are likely to be used, is devoted to Nevada, Utah and parts of Idaho, Wyoming and Colorado. The previous installment covered Michigan, Ohio and Western Pennsylvania.**

**The first article summarized the basic equation for heat required for snow melting and defined the free air ratio as the ratio of slab area free of snow to total slab area.**

**In order that each installment of this series can be understood the opening information on class of systems and the explanation of the four tables are repeated from the first installment.**

THE total heat output of a snow melting system depends on the rate at which it melts the snow, and this rate in turn depends on the relative importance of rapid snow removal among the different types of applications. Snow melting systems can be classified as follows:

Class I (minimum): Residential walks or driveways and interplant areaways;

Class II (moderate): Commercial (stores and offices) sidewalks and driveways and steps of hospitals; and

Class III (maximum): Toll plazas of highways and bridges, and aprons and loading areas of airports.

These classifications depend upon the allowable rate of snow melting. For example, a residential system does not have to melt snow as rapidly as a commercial system. In fact, a depth of snow of an inch for an hour or so during a heavy storm might not be objectionable with a residential system. On the other hand, a store manager would claim the system was inadequate if half an inch accumulated on the sidewalk in front of his store. The difference, then, between a Class I system and a Class II system is in the ability of each system to melt snow. The one feature that is common to all classes is that the systems must be adequate for some combination of weather factors. Or, the designer wants to be able to say that he will pay to melt snow whenever conditions are milder than some critical value, but he is willing to have an inadequate system for a given fraction of the time. In other words, the designer will run a calculated risk providing he knows the odds of that risk. For a residential system,

**TABLE 1—GENERAL INFORMATION ON SNOWFALL, WESTERN CENTRAL ROCKY MOUNTAIN REGION**

| Item | Reno, Nev. | Mt. Home, Ida. | Ogden, Utah |
|---|---|---|---|
| Approximate mean number of days with an inch or more of snow on the ground | 30 | 50 | 55 |
| Average number of inches of snowfall per year | 28.4 | 17.7 | 88.7 |
| Greatest snowfall in 24 hours, inches | 22.5 | 13.0† | 15.3‡ |
| Greatest depth of snow on the ground, inches | 30.0 | 18.0† | 23.0‡ |
| Mean number of days per year with snowfall of 1 inch or more | 6 | 8† (34 with trace amounts) | 18‡ (69 with trace amounts) |

† For Boise, Idaho
‡ For Salt Lake City, Utah

where initial cost must be at a minimum, the designer must accept more frequent snow accumulations.

Naturally, the owner is not concerned about an explanation of why there is an accumulation of snow on the sidewalk. It is immaterial whether the accumulation is due to an excessive snowfall or whether it is due to an extremely cold snowfall. In both cases, the ultimate reason is that an inadequate flow of heat is reaching the surface. The true analysis of heat output, then, depends on an analysis of the weather. This is true of all three system classes.

The total heat requirements of a snow melting system are determined, therefore, by (a) the total area of the snow melting slab, (b) the rate at which the snow is to be removed, and (c) the values and frequency distribution of each of the pertinent climatic variables (humidity, wind, temperature, and snowfall). Obviously (c) varies from city to city and, due to the complexity and number of calculations to obtain a frequency distribution of the four variables, the evaluation of (c) has been virtually impossible. However, by the use of punched cards and statistical tabulating machines, data have been derived so that the heat requirements for a given city can be simply presented.

The designer needs two types of information. First, the most severe combinations of variables on which to base his *design output*, and, second, the heat required over the season so that *operating costs* can be determined. These data are given in Tables 1, 2, 3, and 4 which follow and which cover three cities in the North Mideast region of the U. S.

### Table 1

The first table gives some generalized information on snowfall and snow on the ground. The next to last item, "Greatest depth of snow on the ground" indicates the greatest depth to which snowfall has ever accumulated. Other items are self-explanatory.

### Table 2

Table 2 contains the operating information of a snow melting system. For freezing temperatures (32 deg and below) but no snowfall the system may be "idling." That is, the designer may want to supply some heat to the slab so that there will be immediate melting when snow starts to fall. The column on mean temperature gives the average temperature during *freezing* temperatures. This temperature is used in calculating the "idling" load. The other term needed to calculate idling load is the wind velocity during the period of freezing temperatures.

The column "Hours of Snowfall" indicates the number of hours that snow is falling at rates equal to or greater than 0.01 inch of water equivalent per hour. Roughly speaking there are snowfalls of "trace" quantities about twice as often as there are for measurable quantities of 0.01 inch or more. It is assumed that these light falls can be handled by the idling load.

The remaining columns of Table 2 represent the frequency distribution of required heat output. This distribution is based on the solution to the basic equation for

**TABLE 2—DATA FOR DETERMINING OPERATING CHARACTERISTICS OF SNOW MELTING SYSTEMS, WESTERN CENTRAL ROCKY MOUNTAIN REGION[1]**

| City | Period of No Snowfall: Air Temperature, Deg. F[2] — Over 32 (Per-cent of Winter Hours with No Snow at Above Temp.) | Period of No Snowfall: Air Temperature, Deg. F[2] — Below or Equal to 32 (Per-cent of Winter Hours with No Snow at Above Temp.) | Mean Temp. During Freezing Period[6] | Wind Velocity, Freezing Period, mph[6] | Period of Snowfall[3]: Hours of Snowfall[2] — Per-cent | Hours of Snowfall[2] — Hr. per Year | Free Air Ratio, $A_r$ | Required Output, Btu per Sq. Ft.[4]: 0-49 (Frequency Distribution of Snowfall Hours at Above Outputs, Per-cent[5]) | 50-99 | 100-149 | 150-199 | 200-249 | 250-299 | Maximum Output, Btu per Sq. Ft. per Hr. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Reno, Nev. | 56.0 | 41.6 | 24.3 | 5.6 | 2.4 | 87 | 1 | 82.6 | 15.4 | 1.8 | 0.2 | — | — | 152 |
| | | | | | | | 0 | 90.2 | 8.0 | 1.6 | 0.2 | — | — | 154 |
| Mt. Home, Ida. | 56.3 | 42.6 | 24.9 | 9.5 | 1.1 | 40 | 1 | 74.2 | 21.9 | 3.9 | — | — | — | 143 |
| | | | | | | | 0 | 98.1 | 1.9 | — | — | — | — | 90 |
| Ogden, Utah | 50.0 | 45.6 | 24.3 | 9.4 | 4.4 | 160 | 1 | 64.6 | 29.2 | 5.8 | 0.3 | 0.1 | — | 216 |
| | | | | | | | 0 | 88.8 | 9.4 | 1.4 | 0.3 | 0.1 | — | 216 |

[1] The period covered by this table is from Nov. 1 to March 31, incl., with February taken as a 28¼ day month. Total hours in period = 3630.
[2] The percentage in Columns 2 and 3 plus the percent under operating time total 100%. Note that "Hours of Snowfall" does not include idling time, and is not actual operating time. See text.
[3] Snowfalls of trace amounts are not included; hence, "Hours of Snowfall" includes only those hours of 0.01 inches water equivalent per hour snowfall
[4] Output does not include allowance for back or edge losses since these depend on slab construction.
[5] Percentages total 100% of the number of hours per year of snowfall.
[6] "Freezing Period" is that during No Snowfall when the air temperature is 32 deg or below.

two values of the free air ratio $A_r$. This distribution represents the heart of the analysis and is also the basis for Tables 3 and 4.

### Table 3

Table 3 contains the *design* heat requirement—as explained in the footnotes to Table 3. These design rates may be altered by the designer if he feels that a particular job should have a different design criterion from those given in the footnote. Any change in design selection should be based on the frequency distribution given in Table 2.

### Table 4

Table 4 contains the data required to estimate the operating cost of a snow melting system. The footnotes to Table 4 explain the various items.

### Use of the Tables

*Example:* An engineer has been retained to design a snow melting system for a nightclub in Reno, Nevada. What design rate should he use?

*Solution:* An examination of Table 2 shows that the maximum output for $A_r = 0$ is 154 Btu per (hour) (sq ft) and for $A_r = 1$ the output is 152 Btu per (hour) (sq ft). (This has been explained as being due to snowfalls at temperatures above 33 deg) Examination of Table 3 shows a Class III design rate of 155 and a Class II rate of 154, while examination of Table 4 shows that the annual output for melting would be identical for Class II and Class III system, namely 3030 Btu per (year) (sq ft).

From these examinations, the designer realizes that snowfalls are infrequent, but can be quite heavy. Furthermore, it is safe to say that the snow will rarely last for an extended period; as a result, the owner would not tolerate a system that allowed considerable snow accumulation — even at start-up. The designer should, therefore, have adequate heating capacity for quick pick up, or expect to operate the system to maintain a 33 deg slab surface temperature.

There is one other consideration. Even though snows frequently occur at temperatures at or above freezing, there is a considerable period of time when the air temperature is quite cold. This is illustrated in Table 2 by the fact that the average temperature is 24.3 deg for periods of freezing temperatures which occur 41.6% of the time. In other words, it would be extravagant to operate the system whenever the air temperature fell below 32 deg. On the other hand, it would be prudent to instruct the operator to start the system whenever the Weather Bureau predicted snow so that the slab could warm up.

One redeeming feature is that most snows occur on falling temperature; hence, snows falling at 33 deg or higher will generally melt as rapidly as they fall until the slab is cooled. This will give some additional time for the system to get started.

Even though this is a commercial application which would be normally a Class II system, the designer should elect to use a design output of 155 Btu per (hour) (sq ft). In addition, some consideration should be given to edge and back insulation in order to reduce the start-up time.

**TABLE 3—DESIGN DATA FOR SNOW MELTING SYSTEMS. WEST CENTRAL ROCKY MOUNTAIN REGION**

| City | Design Output, Btu per (Hour) (Sq Ft) | | |
|---|---|---|---|
| | Class I System[1] | Class II System[2] | Class III System[3] |
| Reno, Nev. | 98 | 154 | 155 |
| Mt. Home, Ida. | 50 | 90 | 140 |
| Ogden, Utah | 98 | 216 | 217 |

[1] For Class I (residential) Systems, the design output is set at that required heat output (see Table 2) when $A_r = 0$ at the 98th percentile of the frequency distribution; that is, where 98% of the hours have this output or less.

[2] For Class II (commercial) System, the design output is the maximum output when $A_r = 0$ in Table 2 (last column).

[3] For Class III (industrial) Systems, the design output is determined by the following four requirements: (1) Output is never exceeded for two consecutive hours; (2) Output for $A_r = 1$; Table 2, is at least 1 Btu per hour per sq ft greater than maximum output for $A_r = 0$; (3) $A_r$ is greater than or equal to 0.5 the maximum requirement shown in Table 2 for $A_r = 1$. That is, $q_d = q_e + q_m + 0.5\ (q_e + q_h)$ for the conditions where $q_t = q_s + q_m + q_e + q_e$ are a maximum; (4) The free air ratio $A_r$ is unity for at least 98% of the hours listed in Table 2.

### West Central Rocky Mountain Region

This region is bounded on the west by the Sierra Nevada Mountains and on the east by the Rocky Mountains. The entire region is mountainous and is fairly high (elevation ranging from 3000 to 5000 ft.) The three cities used to illustrate the climate of this region are Reno, Nevada; Mt. Home (Boise), Idaho; and Ogden (Salt Lake City) Utah.

The mountains to the east and west form barriers to the flow of air masses, hence this region has relatively low humidity. Most winter precipitation is after January. Trace quantities of snow are generally recorded in October and April but practically all of the snow falls between November and March.

The western edge of this region, represented by Reno, has the mildest temperature. Snow seldom remains on the ground longer than four days at a time. The main city of the northern section of the region is Boise (weather records for Mt. Home, about 40 miles from Boise, are given in this article). Trace quantities of snow have been reported once in September (for 1934) and quite often in May, but the bulk of the snow falls within the five month period of November to April. January alone averages about 6 inches of the seasonal average of a little over 15 inches.

The Salt Lake City-Ogden area on the eastern edge of this region is the most arid. In Salt Lake City about 25% of the winter storms deposit 2½ inches of snow and thereby cripple traffic. The average duration of continuous snow cover is about 30 days and reaches a maximum depth of 9 inches. Other general data of interest are given in Table 1.

The snowfall in this region is generally mild, especially in the western area. The greatest need, and highest design requirement, is in the Salt Lake City-Ogden area. It is interesting to note in Table 2 that the maximum requirement for Reno and Ogden for $A_r = 0$ and $A_r = 1$ are practically identical. This unusual condition seems to be paradoxical but results from heavy snowfall at temperatures of 33 deg (or higher). The air mass over the panel is above freezing, as that the panel is being warmed somewhat. This means that heat transfer is *from* the air *to* the panel whereas, normally, heat transfer is from the panel to the air. This unusual condition shows up again in the design rates for Classes II and III shown in Table

**TABLE 4—YEARLY OPERATING DATA, WEST CENTRAL ROCKY MOUNTAIN REGION**

| City | Idling | | | Melting | | |
|---|---|---|---|---|---|---|
| | Time,[1] Hr. per Year | Rate,[2] Btu per (Hour) (Sq. Ft.) | Output,[3] Btu per (Year) (Sq. Ft.) | Class | Time,[4] Hr. per Year | Output,[5] Btu per (Year) (Sq. Ft.) |
| Reno, Nev. | 1510 | 36.9 | 55,700 | I | 87 | 2970 |
| | | | | II | 87 | 3030 |
| | | | | III | 87 | 3030 |
| Mt. Home, Idaho | 1546 | 41.9 | 64,800 | I | 40 | 1260 |
| | | | | II | 40 | 1530 |
| | | | | III | 40 | 1590 |
| Ogden, Utah | 1655 | 44.6 | 73,800 | I | 160 | 7050 |
| | | | | II | 160 | 7370 |
| | | | | III | 160 | 7370 |

[1] From Table 2, Column 3 × 3630 (hr per year).
[2] Rate when idling, Btu per (Hr) (Sq Ft) = (0.27V + 3.3) (32 — t), where V = wind velocity from Column 5, Table 2, and t = air temperature from Column 4, Table 2.
[3] Product of the two preceding columns.
[4] Hours of Snowfall, from Column 7, Table 2.
[5] Based on the condition that surface temperature is maintained at 33 deg until required output exceeds design output, at which time design output is used regardless of required output. Distribution of required output based on Table 2.

3. Rule 2, given in the footnote to Table 3, requires that the design rate for a Class III system is at least Btu per (hour) (sq ft) greater than for a Class II system. For all practical purposes, however, there are just two classes of systems for the Reno and Ogden areas.

The operating costs for snow melting systems in Reno and Ogden—for the melting period—are essentially the same for all classes of systems. This is another indication that the bulk of the snowfalls are during temperatures around freezing, and while the wind velocities are low.

The load to idle the systems for all times when the air temperature is below freezing would be prohibitively high. For Ogden the idling load would be 10 times the melting load, for the Boise-Mt. Home area it would be 40 times. For this area, the great difference is due to the very low operating time of 40 hours per year. For the usual ratio of approximately two hours of idling per hour of melting, the idling load would be very reasonable. For Reno the idling rate is a little over one-third the design rate of a Class I system; for Ogden it is about half.

The snow melting requirements for the West Central Rocky Mountain region are mild. As a result, operating costs are low. First costs, however, are apt to be high for the amount of time the systems will be in operation. This is because the snows that do occur are quite heavy. It is likely, therefore, that only critical areas could justify the use of a snow melting system.

*(The November installment of this series will cover the Seattle-Portland-Spokane area).*

## Air Conditioning Factories for Comfort Is a Trend

A nationwide survey just completed by The Trane Company notes a definite trend toward air conditioning of U. S. factories for employe comfort and efficiency as distinguished from process air conditioning. In the survey, leading architects and consulting engineers were interviewed by a cross-section of the company's 90 sales offices across the nation.

Factors in the trend include competition for skilled help, the desire to maintain employe efficiency in hot weather, and pressure by labor unions.

One of the questions asked in the survey was: "What proportion of U. S. factories do you estimate will be air-conditioned for comfort by 1960? 1970? 1980? Please split your predictions between new construction and the addition of air conditioning to existing buildings."

Representative answers are as follows:

Dallas: By 1960, 75% of new factory buildings to be air conditioned for employe comfort, 50% of existing buildings; by 1970, 90% in both categories; by 1980, above 95% in both categories.

Houston: By 1960, 50 to 75% in both categories; all present facilities not abandoned by 1970 to be air-conditioned.

Detroit: By 1960, 70% of new factories, 3% of existing factories to be air-conditioned; by 1970, 21 and 9%, respectively; by 1980, 60 and 30%, respectively.

St. Louis: By 1970, 25 and 10%; by 1980, 70 and 20%.

Cleveland: By 1960, 7 and 4%; by 1970, 20 and 15%; by 1980, 35 and 25%; for both new and existing factories making precision and technical equipment, by 1960, 25%, by 1970, 40%, by 1980, 75%.

New Orleans: By 1960, 50% in both categories: by 1970, 75% in both; by 1980, 100% in both.

Atlanta: By 1960, 40 and 10%; by 1970, 80 and 50%; by 1980, 95 and 80%.

San Francisco (where low summer and mild winter temperature was listed as a factor): By 1960, 3 and 6%; by 1970, 12 and 20%; by 1980, 25 and 30%.

Chicago: 3% by 1960, 15% by 1970, 35% by 1980, 90% of those figures in new construction.

AIR CONDITIONING, HEATING AND VENTILATING'S

Reference Section

# Design of Ice Skating Rinks

C. V. BENGLE

Manager, Applied Systems Section, Air Conditioning and Refrigeration Division, Worthington Corp., Ampere, N. J.

**An assembly of design information and construction details for indoor and outdoor ice skating rinks using manufactured ice.**

**AIR CONDITIONING, HEATING AND VENTILATING — OCTOBER, 1956**

# Design of Ice Skating Rinks

C. V. BENGLE

Manager, Applied Systems Section, Air Conditioning and Refrigeration Division, Worthington Corp., Ampere, N. J.

**More than 90% of ice skating, both indoors and outdoors, is done on man-made ice. With this sport increasing in popularity, many cities are interested in ice skating rinks as community recreation. Factors influencing the design of such rinks are discussed, and detailed design and construction information of value to the engineer is presented. Also included are data on floor designs and necessary refrigeration equipment used for skating rinks.**

DURING the past five years, public interest in ice skating in this country has grown by leaps and bounds. Ice skating has always been a popular winter sport, but of late the number of persons taking to the ice has been phenomenal.

Natural ice skating is becoming less and less dependable for winters are getting milder from year to year. This has caused so many skating enthusiasts to turn to rinks with manufactured ice that today more than 90% of the ice skating in this country is done on man-made ice, both indoors and outdoors.

Clubs, communities and recreational centers throughout the country are having ice rinks constructed to satisfy the public's demand for skating. Youngsters in the South and Southwest can enjoy ice skating as well as children in any other part of the country. Many communities now consider an ice rink a necessary facility for outdoor recreation. Some communities are eager to provide all-winter skating for their youth, since they have become convinced it is a healthful means for combating juvenile delinquency.

## Location of Rink

Private indoor rinks are usually built into arenas or sports coliseums where other activities can take place. Open air or outdoor municipal rinks should be located near a well populated area, but preferably in a central location accessible from all parts of town. A good location is usually the town ball park or playground area. Existing buildings which could be converted to warming shelters should be considered. If the rink is to be permanent, the general terrain should be properly landscaped to obtain good draining conditions.

## Rink Size

Generally the rink size is governed by its classification. A good rule of thumb is to figure about one person to 25 to 30 sq ft of ice surface for normal refrigeration loads. However, a public skating rink could be just about any size in accordance with the budget allowance, and revenue expected. Curling rink sizes are determined by the number of curling pads required. A standard curling pad is 14 ft wide by 146 ft long. Standard size hockey rinks usually are 85 ft wide by 185 ft long. Some are larger than this because extra dimensions were allowed for hockey boards and railing. Many hockey rinks are used for public skating because their size gives a good average area which will easily accommodate 500 to 600 people. Real large rinks run 185 ft x 200 ft and are known as combination rinks. While they will handle hockey and pleasure skating simultaneously, and are the ultimate in rink design, they are quite expensive.

## Rink Floors

The design of rink floors can be placed under three distinct categories: Permanent concrete deck, open or sand-fill fixed iron pipe grid, and take-up or portable.

## Permanent Concrete Deck Floor

The permanent concrete deck floor is the most expensive but its durability and permanence are well worth the extra investment because along with its winter skating and ice sports application, it can be used in the summer for dancing, roller skating and shuffleboard. This floor is of two types—the general purpose and the all-purpose. Both floors consist of a reinforced concrete slab in which is embedded a system of pipe coils through which flows the refrigerated brine. The general purpose floor is used only for skating during the ice season. After this it is used for other events. It is not recommended for frequent defrostings and intermittent operation. The all-purpose floor, such as is used in sports arenas, is similar to the general purpose floor except that its floor slab is insulated and usually a level subfloor must be constructed on which the insulation is laid. Provision should be made to allow for free movement of the main floor slab relative to the subfloor. In general and all-purpose floor slab construc-

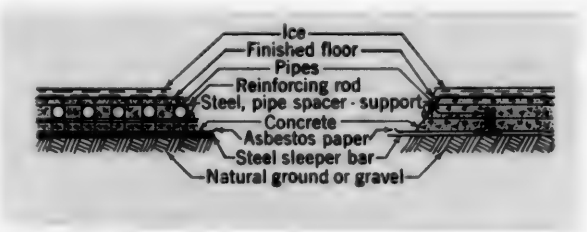



Fig. 1. Permanent concrete deck general purpose floor.

tion lies the secret of the successful rink, coupled with the suitability of the subsoil on which the slab is poured. Proper drainage is a most important requisite in addition to a complete drainage system around the footings of the rink to prevent sepage. Proper drainage should be incorporated under the rink surface.

Ice rinks should not be built on swampy land or land which has inherently poor drainage characteristics. Swampy subsoil will usually freeze in a ground 4 ft or more in depth. Frost heaves raise havoc with the skating surface by making it uneven. Freezing subsoil moves walls, piers and header trenches and can even fracture piping. This will eventually make it necessary to completely rebuild the rink floor.

### Base Preparation

It is recommended that test borings or soundings be made to determine the conditions of the subsoil and the location of the water table. Once these conditions have been obtained, all top soil should be removed and an excavation averaging between 8 to 12 inches in depth, depending on soil conditions, be made the entire area of the rink. The area should then be backfilled with crushed stone or gravel, preferably crushed stone. Cinders are not recommended. This is set down in layers. Each layer should be about 4 inches thick and rolled by means of a power roller weighing about 6 to 8 tons. The rolling shall be continued until there is no movement ahead of the roller. This process should be repeated for each layer. At no time should water be used to settle the fill.

### Preparing the Floor

There are numerous ideas and opinions relative to general and all-purpose floor construction. All of them have merit and are worthy of their designers' capabilities. Many are designed to meet some special application. At any rate, they should all possess the following requisites:

1. Capability of withstanding expansion and contraction without cracking or breaking.
2. Capability of sustaining concentrated loads of equal intensities as those imposed on average street pavements.
3. Uniformity of composition and free from all defects in the body of the concrete.
4. Afford protection of the floor piping from exposure to atmosphere.
5. Withstand repeated freezing and thawing (especially all purpose floors) without damaging effects.
6. Possess a high thermal conductivity rate.
7. Remain perfectly level and have a permanent surface suitable for all uses.

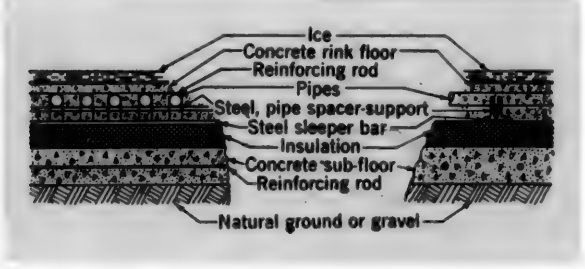



Fig. 2. Permanent concrete deck all purpose floor.

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**A member of ASRE and ASHAE, Mr. Bengle has written many articles published in air conditioning and refrigeration publications.**

Once the base and fill are prepared and ready, the construction of the rink floor can begin.

### General Purpose Floors

For general purpose floors, the use of 3 x 4 or 4 x 4 in. wood sleepers is a thing of the past. Steel sleepers should be used. These can be steel flat bars 3 in x ⅛ in. and 12 ft long. They are placed on top of the level fill and aid in leveling same. They are spaced 6 to 8 ft on centers and set perfectly level at the proper elevation. The level accuracy should be checked by using a surveyor's level. Once the sleeper bars are set, tacked, and leveled, the space between them (if any) is filled with sand, level with the top of the sleepers. Construction or tar paper is then laid over the whole area of the rink, using one thickness with a minimum 3 in. overlap. Special steel spacer supports are then set on the paper over the sleeper bars running parallel to the width of the rink. See Fig. 1.

Once the spacer supports are set in position, the pipes (described under rink piping) are laid on the supports and welding is started. After welding, the level of the pipes is checked again with a surveyor's level so that they do not vary more than ⅛ in. either way from the required level. Improper levels can be corrected by shimming the pipe supports at the right locations.

### All-Purpose Floors

All-purpose floors, generally limited to sports arenas because of their multiple usage, are usually subjected to constant frosting and defrosting and require a subfloor to be constructed to support the main rink floor. This subfloor is a reinforced concrete slab, usually 5 to 6 in. thick, and can be set on piers or on natural ground. This slab must be distinctively separated from the rink floor slab. See Fig. 2.

On outdoor rinks where winter use only is expected, the slabs may be separated by a layer or two of asbestos paper or tar paper. Hot asphalt may be used in the underside of the paper. On arena rinks where ice is continually being made and melted for other year-round floor events, it is necessary to install a layer of thermal insulation to reduce heat inflow to a minimum and to protect the main floor from condensation during the warmer months. The old reliable corkboard, from 2 to 4 inches thick, set in hot asphalt on top of the subfloor slab, is the ideal insulation. Many new board type inorganic insulation materials are on the market and may be used with equal success.

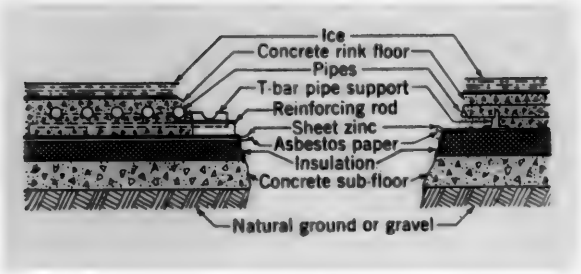



Fig. 3. Details of the Carpenter floor.

Over the insulation, steel flat bar "sleepers", usually 3 in. x ⅛ in. are laid parallel to the width of the rink on 6 to 8 ft. centers. On these bars are placed the pipe supports used to space and support the rink piping. These supports are the same type used and described for the general purpose floor except that they are tack welded to the flat bar sleepers in the field. I-beam sections can be used but must be drilled for proper pipe spacing and cut in half through the web to be used as T-bar supports. This type of support, however, is not as efficient as the special steel support described previously as it breaks the continuity of the concrete slab and leads to less cohesion of the steel and concrete. The rink piping is then laid on the supports as described previously and welding is started. Final leveling is checked, after welding, with a surveyor's level and must be within ⅛ in. variation across the complete rink.

Many patents have been granted for all-purpose floors, usually pertaining to those used in arenas or coliseum rinks where full floating and insulated floors are used. One of the most popular is the Carpenter floor illustrated in Fig. 3. In this design the floating monolithic concrete slab is separated from the subfloor slab by insulation. Over the insulation is placed unsaturated asbestos paper and soapstone powder is dusted over the asbestos paper. Directly over this is laid No. 5 sheet zinc. (.010 in. thick, 0.37 lb per sq ft) with staggered joints, lapped one inch, and soldered. Next is placed the steel supporting and spacing members, usually T-bars, on 6 to 8 in. centers the length of the rink. The floor piping is set on the supports and welded. Then ⅜ in. reinforcing rods are wired to the bottom of the floor piping, usually on 6 in. centers, toward the ends. One-half inch reinforcing rods, usually 8 in. on centers, are used toward and at the center of the rink floor.

## Concrete Floor

After the floor piping has been completed and tested as described under "Piping," the concrete floor construction may begin. Slabs vary from 4¾ to 5¼ inches in thickness including ¼ in. of top finish which is cast monolithic with the main slab. The thickness of the concrete over the rink piping should not exceed 1¼ in. This allows ample concrete thickness for pipe, supports and sleeper bars for 1 or 1¼ in. pipe rinks.

## Forms

Edge forms should run the entire circumference of the rink floor. They are cut to fit over the pipes at the ends and securely braced for protection against lateral movement. The inside face of the forms in contact with the concrete should be about 3 inches back of the face of the puck board (for hockey rinks) so that when the puck board is erected it will rest on the surface of the concrete. Dasher board sleeves must be set properly, usually on 5 ft centers, around the periphery of rink excepting where gates and other corner radii affect the spacing. Sleeves for goal inserts should be set in the proper position.

## Reinforcing for Concrete

Directly on top of the rink piping, ¼ in. round deformed reinforcing bars are laid on 7 to 8 in. centers and wired to the piping at right angles to it, from both rink ends to one-quarter the way up. At this point and to the center of the rink, ⅜ in. round deformed reinforcing bars, 7 to 8 in. on centers, are laid and wired to the piping. Bars should be lapped or spliced a length of 40 diameters.

The piping acts as temperature reinforcement across the floor. The steel bars reinforce the floor longitudinally and bind the floor so that, as the floor contracts, the bars also contract and pull the floor on its bed thus preventing any separation of the concrete.

It will be easily seen that the maximum movement is at the outside edges and the minimum movement is at the center, while the maximum stress on the steel is at the center and the minimum at the outer edges.

## Preparing and Pouring Concrete

Concrete for the rink floor should be prepared in accordance with the American Concrete Institute's recommended practice for the design of concrete mixes (ACI 613-44) using regular Portland cement and a dispersing agent, complying fully with the water-cement ratio law. The concrete should have the properties that are listed as follows:

1. Strength, 4000 lb.
2. Water-cement ratio, 5 to 6 gal per 100 lb sack of cement.
3. Course aggregate ⅜ in. (square opening).
4. Slump—4 in. maximum, 3 in. minimum.

It should contain not less than 3% nor more than 5% total air by volume in accordance with ASTM method C-138-44. Before any concrete is poured, the finished grades should be established and screed set accurately to these grades. The entire floor should be poured in one continuous operation. It is imperative that there be a marked uniformity, not only in the aggregates and cement, but in the water and temperature at which the concrete is delivered, throughout the entire pour. Power mixers should be used and the mixing and placing should

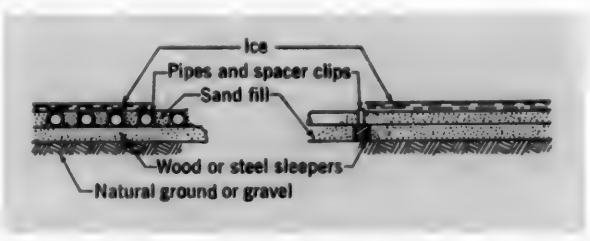
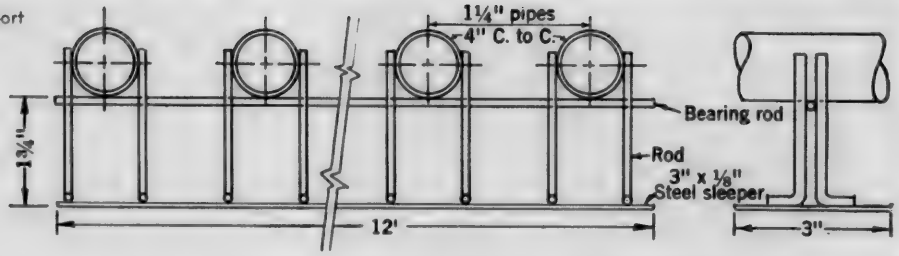



Fig. 4. Fixed steel pipe grid or sand fill floor.

Fig. 5 Steel pipe space support on steel sleeper.



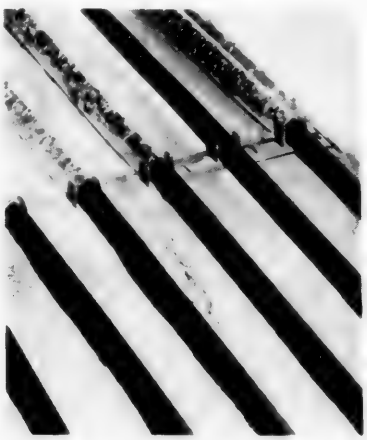

proceed at a uniform rate. The speed at which the concrete is poured should be governed by the number of finishers employed and the time required to trowel the surface to a smooth hard finish. Power finishers are a time saver but the final troweling process should be done by hand.

The top finish goes over the base concrete and is monolithic with it. It can be finish-concrete or terrazzo. The finishing should be done by a good finishing contractor specializing in such work. In fact, only experienced concrete floor contractors should be hired for the concrete floor construction. The level of the finished surface should not vary more than ⅛ in. either way from the true level.

### Fixed Steel Pipe Grid Floor

A fixed steel pipe grid floor is used mostly for outdoor rink applications. It is also known as an open or sand-fill floor rink. This is a single purpose floor and obviously offers no provision for the use of the area when there is no ice. The base for this rink floor should be prepared similar to that for the general purpose concrete deck type previously described which would give the rink ideal drainage conditions and protect it against frost heaving. Once the base is leveled, pressure creosoted wood sleepers, as a rule, are set down on 6 to 8 ft centers and leveled for pipe supports and pipe clips fastened to the sleepers at the proper spacing to hold rink piping. Personally, the use of steel sleepers or supports is recommended because of the longer life. Pipe clips are just as easily fastened to the steel sleepers. Once the rink piping is set and welded in, it is also leveled. Clean washed sand is then filled in and around the sleepers and pipes and leveled off even with the top surface of the pipes. See Fig. 4. A steel pipe spacer support on a steel sleeper is shown in Fig. 5.

Fig. 6. Plastic pipe arrangement on spacer bars showing shields.



This type of rink floor, the general construction of which is cheapest in initial cost of the permanent rink floors, is as efficient in operation as any other; it is also easy to repair or to replace defective floor piping. Its chief disadvantages are rapid disintegration due to corrosion of the floor pipe, its inability to maintain a constant floor level without annual maintenance expense, and lack of usage as a floor when ice is removed.

### Take-up or Portable Floor

With the introduction of plastic pipe, the take-up or portable rink floor has come into existence for the large-size outdoor rinks. Essentially this floor is similar in construction to the fixed iron pipe grid or sand fill floor except that plastic piping is used in lieu of steel. Instead of sleepers and pipe clips, special steel pipe spacer bars are used. These are flat 20 or 22 gauge, 2 in. wide bars punched so as to form a locking space for the bottom of the plastic pipe and at the proper center-to-center distance, usually 3½ in. See Fig. 6. These bars are laid directly on the leveled natural ground or fill. When a vapor barrier or insulation is necessary it is laid over the ground or fill and sealed. Existing surfaces such as tennis courts and playing fields usually require these vapor barriers. The spacer bars are then set on the insulating material, spaced 6 to 8 ft on centers and leveled to within ⅛ in. with wooden shims, using a surveyor's level.

The plastic pipe is virgin black polyethylene of 1 in. IPS. It is extruded in any length and is ordered in lengths equal to the length of the rink so that no joints or cuts are required. The plastic pipe is uncoiled and laid directly into the interlocking jaws of the spacer bars. High impact polyethylene return bends are used with integral adapters. These bends are placed into two pipe ends and secured by special worm wheel type stainless steel hose clamps. After the rink floor has been laid, washed sand is filled in between the plastic piping to the top of the pipe surface but not to cover the tops of the pipes. Protective shields of galvanized steel are usually slipped over the pipe to prevent possible cutting by the sharp edges of the skate blades. Supply and return pipe ends are slipped over steel pipe nipples which are welded into steel headers. Hose clamps hold the pipe ends to these nipples. Supply and return headers are in a trench at the end of the rink and run along its width.

### Pipe Storage

The plastic pipes can be taken up after the skating season and stored for the next season. Storage trenches are

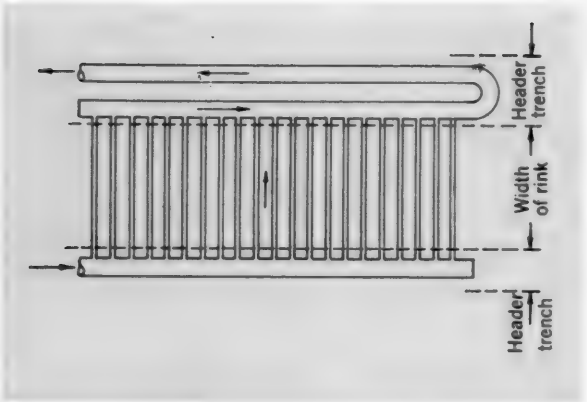



Fig. 7. Cross flow type rink piping—balanced flow system, three headers.

usually constructed at the sides of the rink for this purpose and so built as to form seats for the skaters in lieu of the usual movable benches. On existing hard surfaces, such as tennis courts of clay or macadam or even concrete, a leveling course of sand about 3 in. thick can be laid, screeded off dead level and rolled tight and smooth. The plastic piping can then be laid down right on the sand bed using spacer bars and a slight sand fill. On small portable rink floors used in hotel or night club ice skating acts and small ice shows, this piping is set down directly on wood sleepers over insulating paper resting on the stage or existing wood floors. The plastic pipe is held down on the sleepers by pipe clamps nailed to the sleepers. A low wood wall is built around the perimeter of the rink to enclose the ice field.

### Travelling Shows

Traveling ice shows such as the larger professional ones appearing in many cities without arena rinks, carry their own portable rink floors. These consist of portable pipe grids made of ¾ in. black steel pipe on 2 in. centers with return bends. Steel angle or strap welded to the pipes hold the grid together. They are 20 ft long and 1 ft wide and are seven pass pipe coils so that the inlet and outlet are on opposite ends but have the same direction of flow.

A wood sub-floor is usually laid down over the ground in an open amphitheater or over a slab floor in an arena or coliseum. Insulating paper is placed over the floor and the pipe grids are laid down and interconnected to form a good pattern over the complete floor for the actual rink size. The pipe ends are connected to headers through plastic or rubber hose couplings using hose clamps. The headers are piped to a portable brine refrigeration system mounted in a trailer. After the show is over the grids are disconnected and loaded into a second trailer for transportation to the next engagement.

### Piping

In general and all-purpose concrete deck, and fixed iron pipe grid floors, ferrous pipe is always used. Four types of ferrous pipe may be employed. These are black steel, galvanized steel, black wrought iron and galvanized wrought iron. In the order shown, black steel is the least expensive on first cost and for that reason is most often used. Wrought iron on the other hand offers freedom from corrosion and is therefore more expensive. In open sand fill rinks, therefore, wrought iron pipe is recommended, while in general and all-purpose floors where the piping is thoroughly imbedded and bonded to the concrete, its life may be extended indefinitely and, as a rule, black steel pipe is universally used.

Generally, 1 or 1¼ in. pipe is used, depending upon the designer's preference. The same may be mentioned relative to the pipe center spacing which may vary from 3 to 5 in. Experience has shown that floor piping laid on 4 in. centers gives the best results in temperature distribution and heat absorption. On outdoor rinks it is recommended, but not essential, to use shorter centers, say 3 in., at the sides of the rink for about 3 to 4 ft. to allow more pipe surface per ice surface to compensate for windage or radiation losses which seem to be greater at those areas. Twenty-foot lengths of standard weight pipe should be used to minimize the number of joints. All connections should be welded and threaded connections should be avoided, if at all possible.

The brine temperature range must be kept to a maximum of 3 deg F so the brine quantity to be circulated will be set by this range. This quantity, and the length of the pipe-run between inlet and outlet headers, should determine the size of the pipe. One inch pipe on 3 in. centers is usually suitable for runs up to 130 lineal feet and 1¼ in. pipe on 4 in. centers should be used for longer runs. Brine flow should average between 10 to 12 gpm per tube, giving velocities of 125 to 155 fpm and pressure drops between 1.3 and 2.1 psig per 100 ft of pipe for an average brine temperature of 15 deg. These values are for 1¼ in. black steel pipe, schedule 40, standard weight.

### Types of Arrangements

There are two types of piping arrangements in use today. These are the cross flow type, in which the supply and return headers are placed at opposite sides or ends of the rink (See Figs. 7 and 8); and the return bend or hairpin type, in which the supply and return headers are placed on the same side for brine feed along rink width, and on the same end for brine feed along rink length. See Fig. 9. For both arrangements there are two header systems: the three-pipe or balanced-flow system which uses one supply and two return headers; and the two pipe system which uses one supply and one return header. See Figs. 7, 8, 9 and 10.

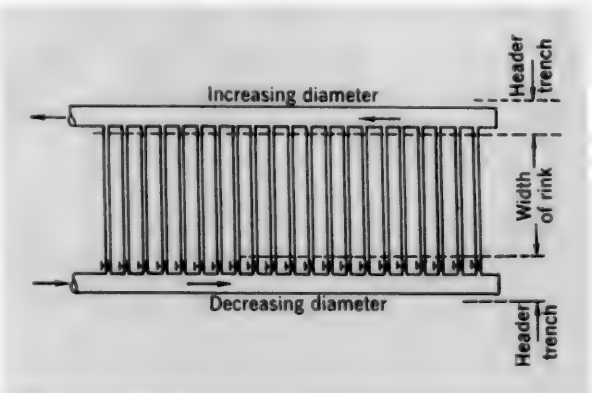



Fig. 8. Cross flow type rink piping—two header system with balance valves.

The balanced-flow system is recommended as there is no restriction to brine flow at any point, and the distribution is uniform regardless of the quantity of brine circulated. When this system is used with the cross-flow piping arrangement, the friction loss generally runs a maximum of 6 psig through the floor piping. In the balanced-flow system, no valves or other means of throttling the brine flow are required at any point. See Fig. 7.

On the other hand, the two-pipe or header system usually requires the use of throttling valves on each run of rink piping. On the hairpin or return bend arrangement, valves are installed at the inlet and outlet of each pipe at the header tap, as Figs. 9 and 10, or one valve is permissible at each return runout from the rink floor.

The cost of an extra header in the balanced-flow system to give a resulting lower over-all pressure drop, versus the two-pipe header system plus throttling valves, is usually less when the headers are along the width of the rink. In actual design and layout, actual computation should be made to decide which system should be used to fit the particular application, taking into consideration first cost, installation cost and operating cost to arrive at the most efficient design.

### Pipe Sizing

In main and header design, sizing should be based on a brine velocity between 535 and 540 fpm with a corresponding pressure drop between 2.3 and 2.5 psig per 100 ft of pipe at an average brine temperature of 15 deg and a brine specific gravity of 1.25. For the average size hockey or public skating rink, 8 in. ips headers are the usual maximum size. Headers may be sized on the constant friction method which would dictate a decrease in size along the longitudinal run as the brine quantity decreased. This design should be followed on a two-pipe header system but on a balanced-flow system, it is not usually necessary. As a matter of fact, most rink designers keep the headers the same size throughout their length for uniformity of material and ease of installation. Expansion joints should be used on both the supply and return mains.

It is necessary to provide some means for venting the air from the rink piping, headers, and mains. Vent cocks can be installed on each run of the return piping if it is above the headers and on the return header if it is higher than the rink piping. The latter is the ideal way. There are combination throttle-and-vent cocks or valves available

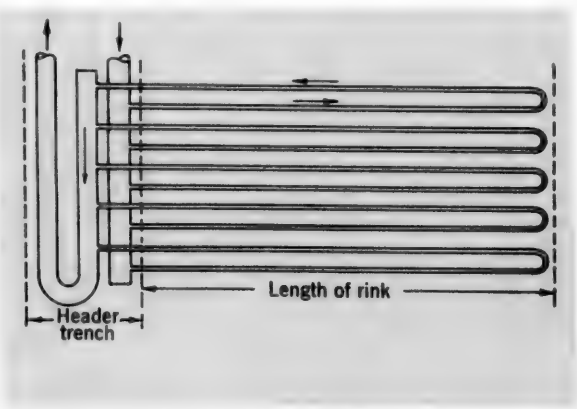



Fig. 9. Return bend or hairpin type floor piping, balanced flow system, three headers.

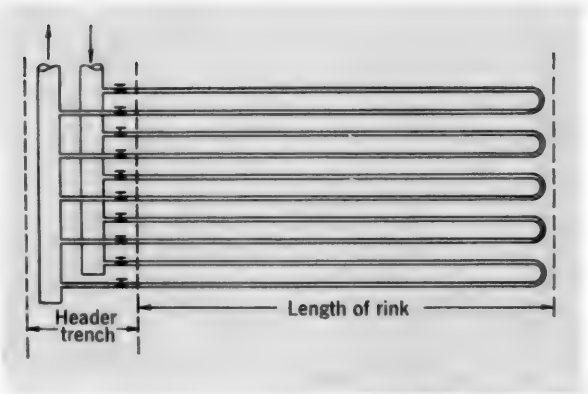



Fig. 10. Return bend or hairpin type floor piping, two-header system with balance valves.

which serve the dual purpose for which they are named.

### Header Trench

The supply and return headers should be housed in a trench which is a necessity in the design of a complete rink. While these trenches may increase the initial cost of the installation, they will, in the long run, save more than their cost. The trench should be of concrete construction, with a drain at one end if the trench floor is pitched one way, or a drain at the center if the pitch is two-way to the center. Its size should be sufficient in cross section to house the headers, header supports, and piping and to permit access for inspection and maintenance. The headers, Fig. 11, and the piping in the trench are not usually insulated. Trench covers are a necessary item and should be made of ¼ in. steel grid or plate cut in 10 ft sections. Handles can be optional.

### Load Calculation

Heat must be removed from the rink floor in order to get the floor temperature low enough to freeze the water which is sprayed over it. This requires mechanical refrigeration, the amount of which varies with quite a few factors. These are: the type of enclosure or protection over the rink; the latitude in which the rink is located; the length of the skating season; the uses to which the rink will be put such as hockey, public skating and curling, and whether the service will be light, average or heavy. In addition, for outdoor rinks one must consider orientation, sun effect, rain, snow, and wind, and last but not least, the latent heat of freezing of the water and the ice thickness.

There is a wide variation of opinion among consulting engineers and rink designers, judging from their installations, relative to the amount of refrigerating capacity necessary in ice rinks. Actual rink installations of the same size and refrigeration capacity requirements have varied in specifications as much as 100% in the refrigeration capacity per square foot of ice surface. It is difficult to theoretically figure or compute the actual refrigeration capacity for an ice rink because of the many variable factors influencing the calculations.

The usual practice in the refrigeration industry is to allow one ton of refrigeration capacity for so many square feet of ice surface. As a result of the hundreds of indoor

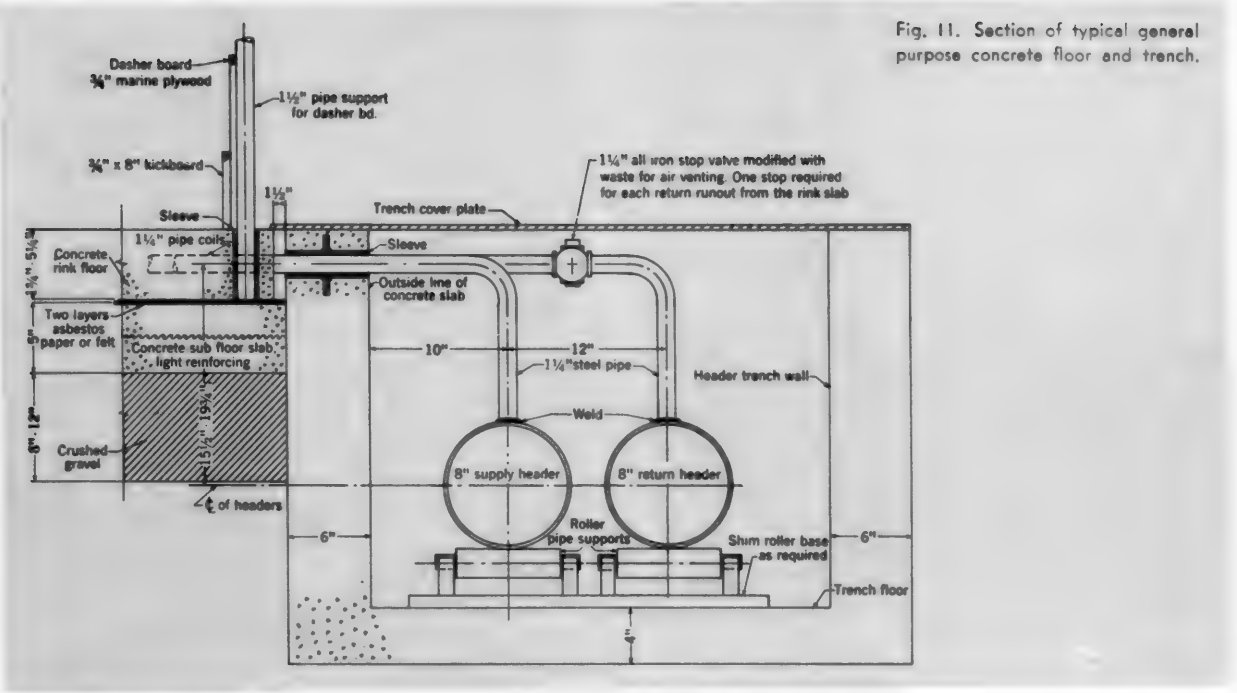



Fig. 11. Section of typical general purpose concrete floor and trench.

and outdoor rinks built all over the United States, many facts have been learned from the operation of these rinks which have helped establish various rules of thumb relative to refrigeration capacity required for many types and sizes of rinks in different localities. The writer has compiled various groups of these data and has attempted to correlate them into tables which give directly the refrigeration capacity expressed in square feet of ice surface per ton of refrigeration for rinks of various types based on the ambient wet bulb temperature in the vicinity of the rink (Tables 1 to 5). Capacities are for ice thickness from ¾ to 1¼ in. considering components of all loads, including latent heat to freeze the water, heat load acquired by convection from the air over the ice surface, humidity load of air to ice, sum of ground, air and sun loads and pull down load in the case of arena rinks.

To use these tables one has only to figure the average wet bulb temperature of the vicinity for the months during which skating will be required. These figures can be obtained from weather bureau records. Enter the table at this wet bulb value for the type of rink and the service, and read off the capacity required in square feet of ice surface per ton of refrigeration. Knowing the ice surface of the rink, it is a simple matter to find the total tons of refrigeration for the rink load.

**TABLE 1. LOAD SELECTION FOR A SHADED OUTDOOR RINK**

General purpose concrete, sand fill, and take up floors; no pull down time; ice thickness 1¼ in.

| Latitude, Degrees | Average Wet Bulb Temperature, Deg F | | | | |
|---|---|---|---|---|---|
| | 35 | 40 | 45 | 50 | 55 |
| | Sq Ft of Ice Surface per Ton of Refrigeration | | | | |
| 44-46 | 370 | 220 | 145 | 100 | 75 |
| 42-43 | 400 | 250 | 155 | 130 | 105 |
| 40-41 | 430 | 280 | 200 | 160 | 135 |

## Cooling Medium

To remove heat from the rink floor, an indirect refrigeration system is used whereby a secondary cooling medium is circulated through the floor piping. This medium is cooled by mechanical refrigeration in a direct refrigeration system. The brine to use is calcium chloride with an average specific gravity of 1.23, a specific heat of 0.68 Btu per lb. and a freezing point of −20 deg.

In this discussion, we will set our minimum brine temperature at 14 deg for all rinks, and since we have already set a maximum rise of 3 deg on the brine based on the gallons per minute per tube of rink piping, we have established a range of 14 to 17 deg. This allows a 0.5 deg temperature rise in the supply main, a 2 deg rise in the rink floor and a 0.5 deg temperature rise in the return main. To dissipate 12,000 Btu per hour using this 3 deg range, and the brine solution mentioned will require a flow of 9.66 gpm per ton of refrigeration. Once the refrigeration capacity is determined, this can be multiplied by 9.66 to arrive at the total flow of brine in gallons per minute for

**TABLE 2.**
**LOAD SELECTION FOR INDOOR PUBLIC SKATING RINK**

General or all-purpose concrete and sand fill floors; no pull down time; ice thickness 1¼ in.

| Service | Average Wet Bulb Temperature Indoors, Deg F | | | | |
|---|---|---|---|---|---|
| | 35 | 40 | 45 | 50 | 55 |
| | Sq Ft of Ice Surface per Ton of Refrigeration | | | | |
| Heavy | 800 | 470 | 300 | 210 | 150 |
| Average | 880 | 520 | 330 | 230 | 170 |
| Light | 960 | 565 | 360 | 250 | 180 |

the entire rink supply. The 14 deg brine temperature gives a good safety factor on both pull down and holding capacity and allows the lower brine temperature necessary for ice hardness control when required.

### Refrigeration Equipment

Now that we have set our load and brine requirements, we must design and select the proper mechanical equipment to handle these. Brine cooling systems are complete refrigerating systems consisting of compressors with their drivers, oil separators, condensers, chillers or evaporators with their heat exchangers and refrigerant control devices, refrigerant piping and refrigerant charge. These systems can be built up on the job or can be complete factory assembled packages if they do not get too large for practical shipping and handling. One installation is shown on Fig. 12.

### Compressors

These are usually of the reciprocating, single acting, vertical, vee, W or radial, multi-cylinder type with forced-feed lubrication. They can be slow or high speed depending upon the preference of the engineer. The compressor cylinders should be fitted with some type of capacity unloaders and the type which unloads the compressor as a direct function of the brine temperature through a brine thermostat is recommended.

Either ammonia or Freon-22 or 12 can be used. Ammonia of course is the ideal refrigerant performance-wise, but many local codes require a licensed operator for ammonia systems, and include certain regulations which control the amount of liquid that can be stored in one spot. These factors should be studied before the refrigerant is selected. Freon-22 is the most widely used refrigerant in rink brine systems today. Its low cubic feet per minute per ton theoretical displacement allows the use of smaller compressors and is a safe refrigerant as well. It helps keep first costs down and that is a big point in its favor.

Two compressors should always be used with each handling one-half of the capacity. In this manner both compressors can be used for pull down and at conditions of peak load, and one compressor usually operated for "holding" the ice. The other machine then acts as a "spare." For real fast pull down, such as is encountered in arena rinks, three compressors are oftentimes used.

Electric motor drivers should be of the high starting torque type using squirrel-cage constant speed induction windings. If the compressors have an unloaded starting feature, the motors may be the normal starting torque type. Multi-V-belt drive or direct connected drive through flexible coupling are both used although the belt drives give better speed selection on the compressors to better balance the compressor capacity against the evaporator load, at fringe or in-between conditions of actual service.

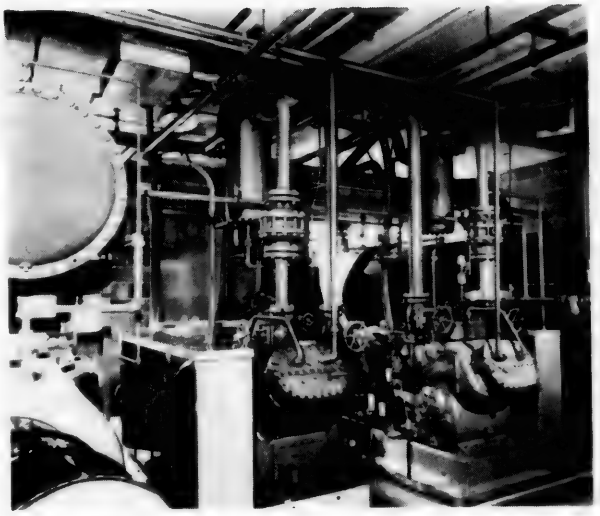


Fig. 12. Refrigeration equipment for ice rink brine cooling.

Starters are governed by the electrical or power company limits on allowable current inrush and these people should be contacted before specifying any starting equipment. Across-the-line full voltage or reduced voltage types may then be selected.

For conditions of service and to handle our brine conditions previously outlined, the writer recommends that the Freon-22 compressor operate at 5 deg suction temperature and 95 deg condensing temperature. At these conditions, 1.5 brake horsepower per ton will be required. The ammonia compressor should operate at 22.5 psig suction or back pressure and 185 psig discharge or head pressure. At these conditions, 1.5 brake horsepower per ton will be required.

### Oil Separators

The use of oil separators is recommended. There should be one installed in the discharge line of each compressor between it and the condenser hot gas inlet. Float type separators operating on the impingement principle, and with an oil return line back to the compressor, assure positive return of oil and are the most efficient. The size of the separator serves the nominal tonnage of the compressor but common practice is to size them according

**TABLE 3.**
**LOAD SELECTION FOR A COLISEUM OR SPORTS ARENA**

All-purpose concrete floor; ice thickness ¾ in.

| Pull Down Time, Hours | Average Wet Bulb Temperature Indoors, Deg F | | | | |
|---|---|---|---|---|---|
| | 35 | 40 | 45 | 50 | 55 |
| | Sq Ft of Ice Surface per Ton of Refrigeration | | | | |
| 10-12 | 295 | 175 | 115 | 80 | 60 |
| 7-9 | 200 | 120 | 80 | 55 | 40 |

**TABLE 4. LOAD SELECTION FOR AN INDOOR HOCKEY RINK**

General or all-purpose concrete and sand fill floor; no pull down time; ice thickness ¾ in.

| Average Wet Bulb Temperature Indoors, Deg F | | | | |
|---|---|---|---|---|
| 35 | 40 | 45 | 50 | 55 |
| Sq Ft of Ice Surface per Ton of Refrigeration | | | | |
| 970 | 570 | 365 | 255 | 185 |

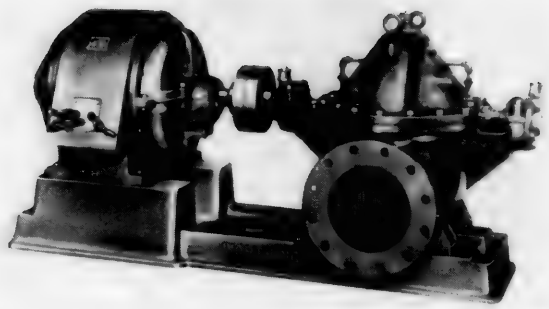


Fig. 13. Horizontally split case, double suction centrifugal pump.

to the compressor hot gas discharge connection and for the proper refrigerant.

### Condensers

Shell-and-tube condensers are usually used where there is an ample supply of cooling water available or where a cooling tower is contemplated. Steel shells are necessary. Recommended are those with multi-pass removable water heads and copper tubes with integral fins or helically wound separate fins bonded to the tubes. For ammonia service, prime surface steel tubes are required. The tubes should be removable in all cases. There should be a condenser for each compressor for proper high side balance. An automatic water regulating valve is recommended when city water is used for the condensers.

The conditions of service of the condenser are a function of the discharge pressure of the compressor as far as the condensing pressure is concerned. For all practical purposes, they are the same. The temperature and quantity of condensing water, and the load, govern the size of the condenser. In this discussion we have set the compressor discharge pressure for F-22 at 184 psig (95 deg saturated vapor) and for ammonia at 185 psig (96 deg saturated vapor). We are setting the condenser water temperature at 75 deg and the quantity as 2 gpm per ton of compressor capacity. Water at 75 deg is available from many city mains during the ice skating season and cooling towers operating at 65 deg wet bulb (the maximum for practical ice making) will supply water at 75 deg off the tower. Compressor rating tables give the heat rejection at the compressor which the condenser must dissipate. Knowing this, the quantity of water available, and the temperature difference between the condenser inlet water and the condensing temperature (refrigerant liquid or saturated vapor temperature at the condensing pressure) the condenser size can be selected from condenser rating tables or curves. Water pressure drops through the condenser should be kept to a minimum for economical selection and performance.

### Evaporative Condensers

Evaporative condensers may be used in lieu of shell-and-tube condensers. These may be the conventional or blow-through type. The condensing coil should be all prime surface copper for Freon service and galvanized steel for ammonia service. Some type of modulating air inlet damper controlling condensing pressure should be used. The outside casing should have a weatherproof finish and a hot-dipped galvanized finish is recommended. Evaporative condensers are rated in Btu per hour of heat rejection the same as shell-and-tube condensers. They operate at the same condensing pressures or temperatures but depend upon the outdoor wet bulb air temperature for their capacity. For our conditions of service a maximum of 65 deg wet bulb temperature is selected for the cooling tower. We can now go into the evaporative condenser rating tables or curves and make a selection as we know the heat rejection, the condensing pressure or temperature and the operating wet bulb temperature. For economical selection of evaporative condensers there should be a minimum temperature difference of 30 deg between the air wet bulb temperature and the condensing temperature of the refrigerant.

### Refrigerant Receivers

Receivers are necessary to store the refrigerant during times for repair of any component of the system or for shut down periods. They also afford an operating liquid seal to the refrigerant cycle.

Many shell-and-tube condensers have storage capacity for the entire refrigerant charge in Freon systems, unless a flooded chiller is used, and their sumps serve as a seal. Otherwise storage receivers must be added. They may be bypassed, however, during the operating cycle.

Receivers, operating and storage, must be used with evaporative condensers. They are merely unfired pressure vessels with the proper isolating valves and should have a liquid level column gage on them. They should be able to store the complete charge of refrigerant when 85% full. They are selected first by computing the refrigerant charge in pounds of the complete system. Then refer to the proper refrigerant tables showing the properties of saturated liquid and obtain the density of the liquid in pounds per cubic foot at the ambient storage temperature. Convert the refrigerant charge in pounds, to cubic feet by dividing by the density of the liquid. The quotient is the theoretical volume of the receiver required when 100% full. Divide this volume by 0.85 to arrive at the actual volume of the receiver necessary for storage purposes. Select the proper size from receiver specification sheets.

### Brine Chillers

To chill the calcium chloride brine which is circulated through the rink piping, horizontal shell-and-tube brine chillers are used. For Freon application, we recommend the direct or dry-expansion type with the refrigerant evaporating in the tubes and the brine in the shell with the proper baffle spacing. The tubes must be steel, all

**TABLE 5. LOAD SELECTION FOR INDOOR CURLING RINK**

Sand fill floor; no pull down time; ice thickness 1 in.

| Average Wet Bulb Temperature Indoors, Deg F | | | | |
|---|---|---|---|---|
| 35 | 40 | 45 | 50 | 55 |
| Sq Ft of Ice Surface per Ton of Refrigeration | | | | |
| 1210 | 690 | 440 | 290 | 210 |

prime surface or with steel fins. Single chillers are available up to 150 tons in capacity and with two compressors, two refrigerant circuits should be used, giving two separate closed refrigeration cycles. Discharge check valves are recommended. Dry expansion chillers assure positive oil return because of higher refrigerant gas velocities in the evaporator.

Refrigerant feed to the chiller should be through a direct acting full capacity thermal expansion valve for each circuit or an indirect acting liquid feed expansion valve operated by a small thermal expansion valve pilot. Liquid-to-suction heat exchangers may be used but on Freon-22 should be selected for minimum superheat control at the compressor suction. Proper liquid line solenoid stop valves should be used, full size or on the pilot line and wired in the compressor motor circuit assuring positive liquid flow stop on shut down.

Flooded type horizontal shell-and-tube chillers with brine in the tubes and refrigerant in the shell may be used on Freon but are recommended for ammonia service. Surge drums should be used in full tube chillers for proper ebolution of liquid refrigerant and maximum elimination of liquid slopover to the compressor suction. Multipass brine front and end heads give the proper brine velocity in the tubes. This should run between 240 and 360 fpm. Steel prime surface tubes are used.

Liquid feed to the shell is through high or lo-side floats or float piloted liquid feed valves. Lo-side control is recommended for higher evaporator efficiency through proper refrigerant level. When employing flooded chillers with Freon. an oil recovery device or return system should be used to assure proper return of oil to the compressors. It is apparent that with the refrigerant in the shell, there is a great deal more in circulation, plus some entrained oil. Low velocities in the flooded evaporator shell hinder the return of oil, so it must be helped back to the crankcase of the compressors. The tubes in the chiller should be removable.

### Evaporating Temperature

Since the brine flow of 9.66 gpm per ton of refrigeration and the temperature range of 17 to 14 deg has already been set for all ice rinks under discussion, we have only to set our evaporating temperature in the chiller to make a selection. We have set 5 deg as the saturated suction temperature at the compressor so for short suction line jobs, say about 10 ft in length, it is recommended to add one degree and arrive at 6 deg evaporating temperature for chiller selection. On longer suction lines, two degrees should be added to allow for suction line drop and a chiller safety factor. Chiller rating tables and selection charts may now be referred to for proper selection. Brine pressure drops through the chiller should be kept to a minimum for economical selection and performance.

TABLE 6. LINEAL FEET OF BLACK STEEL PIPE PER CUBIC FOOT OF BRINE

| Pipe Size. In. Dia. | Lineal Feet |
|---|---|
| 1 | 166.6 |
| 1¼ | 96.5 |
| 6 | 50.0 |
| 8 | 28.8 |

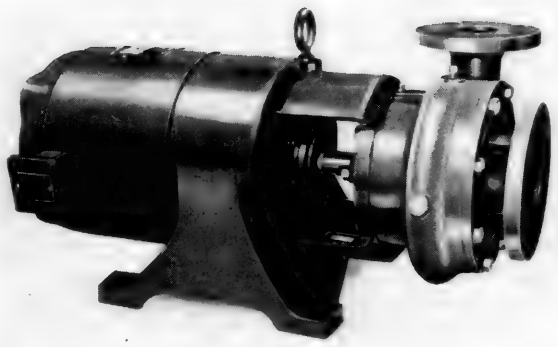


Fig. 14. Close coupled, end suction centrifugal pump.

### Centrifugal Refrigeration

On the larger rinks, especially of the arena or coliseum type, centrifugal refrigeration brine cooling systems have been used and are becoming more popular. These systems represent the ultimate in refrigeration equipment and are used only where first cost is not the main factor. These systems incorporate a high speed centrifugal compressor (3000 to 6000 rpm) of volute or diffuser design using multistage impellers, a shell-and-tube condenser, a shell-and-tube brine chiller, a speed increasing gear, and a motor drive, all mounted on a single foundation and interconnected so as to form a complete self-contained refrigeration cycle ready for condenser water connections and brine connections to the condenser and cooler flanges respectively. Constant speed or variable speed wound rotor motor drives are used and modulating capacity control as a direct function of brine temperature is obtained through the use of an automatic suction damper at the compressor.

The conditions of service on the brine side are the same as for systems using reciprocating compressors but vary on the refrigerant side depending upon the refrigerant used. F-11 and F-14 were the refrigerants more commonly used but they are gradually bowing out to F-12 in the newer higher pressure and speed centrifugal machines. For selection, refer to manufacturer's application and rating data.

Cooling towers, or spray ponds must always be used for condenser water cooling in centrifugal refrigeration systems.

### Refrigerant Piping

Freon piping should be hard drawn copper and should not be lighter than Type *L* for field assembly, or Type *M* for shop assembly. Joints should be sanded, cleaned, fluxed, and soldered, using a silver base alloy. Above 4⅛ in ODS copper size, black steel pipe may be used, using welded joints.

For ammonia, black steel or wrought iron pipe should be used. On low pressure lines, standard full weight, Schedule 40 pipe is permissible. On high pressure lines, extra heavy, full weight, Schedule 80 pipe must be used.

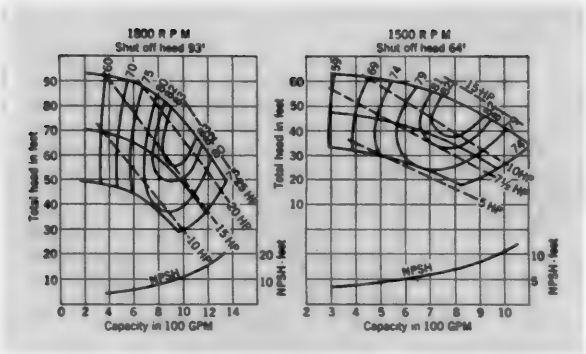



Fig. 15. Typical pump rating curves.

Welding should be used as far as practicable in the installation.

All piping should be in accordance with ASA B36.10-1950 piping specifications and ASA B9.1 safety code for mechanical refrigeration 1950.

Selection of refrigerant piping sizes shall be in accordance with usual ACRMA equipment standards for the refrigerant selected.

### Insulation

All brine supply and return mains, valves, as well as refrigeration suction piping and fittings should be insulated with 2 to 3 in. thickness solid type cork or some inorganic insulating material. Moldings of semi-cylindrical shape to fit standard pipe and fittings are available in cork, and many other materials. It should be well sealed and may be painted or covered with an outer finish at the designer's option.

The brine chiller should be insulated with 4 in. thickness solid type cork or some inorganic insulating material, beveled lags, or blocks. Each lag or block should be dipped on back surface in hot asphalt, and pressed firmly to the chiller shell. Butting sections must be properly sealed. Galvanized steel strap, ¾ in. x 0.20 in., should be banded around the circumference of the shell. A finish should be incorporated which provides a good protective vapor seal on the outside of the insulation. A Portland cement finish applied in two coats is recommended. The first coat should be thin and well scratched. The second coat should be float finished, and blocked off in squares of suitable size. For a less expensive finish, heavy canvas may be cemented to the cork and painted with a waterproof paint. Asphalt primer may be applied directly over the insulation, and paint applied over the primer for an inexpensive finish.

The brine tank may be insulated with 2 to 3 in. thickness cork board or other inorganic insulating board, adhered to the surface with hot asphalt or waterproofing cement and sealed at the joints. Finishes as described are at the designer's option.

### Pumping Equipment

For calcium chloride brine application, the circulating pumps should be of all iron construction with mechanical seals, and single stage design. Two types are available: (1) horizontally split case, double suction, (Fig 13) usually a heavy duty pump; (2) end or side suction; both types are for direct drive through flexible coupling and mounted on base plate with their motor drivers. End suction pumps are available in the close-coupled type with the pump impeller and motor armature shaft integral. The pump is flange mounted to the motor frame, Fig. 14.

Two brine pumps are recommended for ice rink application. Each pump should be able to handle the total circulation of brine for the complete rink. In this manner one pump is used as a spare. Each pump should be valved on both the discharge and suction sides, and a brine strainer should be installed at the pump section to insure good service.

For the condenser cooling water, the same type pumps may be used except that they may be cast iron casings, bronze fitted.

### Pump Selection

To select the brine pump, two factors must be known, (1) the quantity of brine in gpm to be circulated and (2) the total dynamic head in feet against which the pump must operate. We have established our brine quantity for our brine chiller selection so we know its value. Total dynamic head is the sum of static head in feet and the friction head (loss) in feet in the longest run of brine from the pump discharge through the system, and back to the pump suction. Static head is the difference in elevation between the highest and lowest brine levels in feet. The system friction head or loss is the sum of the losses through the supply line from the pump discharge to the chiller, through the chiller, the supply main, the rink supply header, the run of rink piping furtherest away from the supply main, the return header, the return main, and the return line from the brine tank to the pump suction.

The valves and fittings must be converted to lineal feet of equivalent straight pipe for their respective sizes. The length of each size pipe must be calculated in the brine run. Knowing the gpm of brine flowing in each pipe size, it is a simple matter to find the pressure drop per 100 ft of pipe of the various sizes from pressure drop tables. After adding the equivalent feet of straight pipe of the valves and fittings to the same size pipe lengths, the total friction loss or pressure drop for the actual length and size can be computed. These various losses or drops are added together and the sum is the total friction loss or head for the brine run. Since the tables are for water flow, the friction loss must be corrected for pressure drop for calcium chloride brine. This gives the multiplier to be used knowing the brine specific gravity and average temperature.

We now have our static and friction loss or head, and the sum of the two gives us the total dynamic head in feet against which the brine pump must operate. Referring to pump rating curves for the type pump specified, the proper pump may be selected. See Fig. 15.

To select the correct motor size to drive the pump, we go to the horsepower curve or chart noting the brake horsepower for the pump selected, this being for handling water. This horsepower value is multiplied by the specific gravity of the brine, and the result is the brake horsepower required to handle the brine. Knowing this value, the proper size motor may be selected.

## Electrical Controls

Automatic operation of the refrigeration equipment is recommended for continuous operation and uniform delivery of the brine at constant temperature.

Automatic starters should have remote push button stations and separate fused disconnect switches. All wiring, application, and sizing of electrical equipment shall be in accordance with local electrical codes and ordinances.

The brine pump motors and cooling tower pump motors should be electrically interlocked with the compressor motors so that the compressor motors cannot operate until the brine and tower pump motors are operating. On evaporative condenser applications, the spray pump and fan motors should be interlocked with the compressor motors. There should be a separate relay which will cut out the spray pump and allow the evaporative condenser to run dry with fan only when outside air temperature is below freezing.

## Temperature Control

Brine outlet temperature from the chiller should be automatically controlled. The recommended method is from a modulating type remote bulb electrically operated temperature controller of at least 2-steps. When two compressors are used, then two temperature controllers may be applied. The controllers or thermostats should have adjustable settings of cut-in, cut-out, and differential points. The thermal bulb is placed in the bulb well of the chiller and if such a well is not provided, the bulb may be inserted into a fitting forming an integral part of the brine outlet piping from the chiller.

The compressors should be equipped with 50% capacity unloading as heretofore specified and the unloading should be a direct function of the temperature controller. The first step of capacity control should unload the compressor to 50% capacity on a drop in brine temperature at the thermal bulb. On a further drop in brine temperature, the thermostat on its second step should cut off the compressor. For two compressors a sequence drop in temperature can be worked out and the settings of both thermostats can be arranged as a 4-step series control with one compressor unloading to 50% capacity, then cutting off, followed by the second compressor behaving similarly on further drop in brine temperature sensed by the second thermostat. As the brine temperature starts to rise, the reverse operation will take place.

As the brine load is varying very gradually, there should be no sudden upward surge in brine temperature to cause both compressors to start simultaneously while operating on automatic step control. To prevent this, of course, time delay relays can be used which will keep one compressor from starting until the other has picked up the load or until its motor has come up to full load speed.

Safety controls, such as low temperature freeze-up thermostats, positive pump pressure controls or low brine pressure controls, are recommended and should be wired into the compressor motor circuit. The usual refrigeration safety controls, such as high and low refrigerant pressure controls, oil failure cutout switches, and crankcase heater thermostats, etc., are supplied with the compressors by most manufacturers.

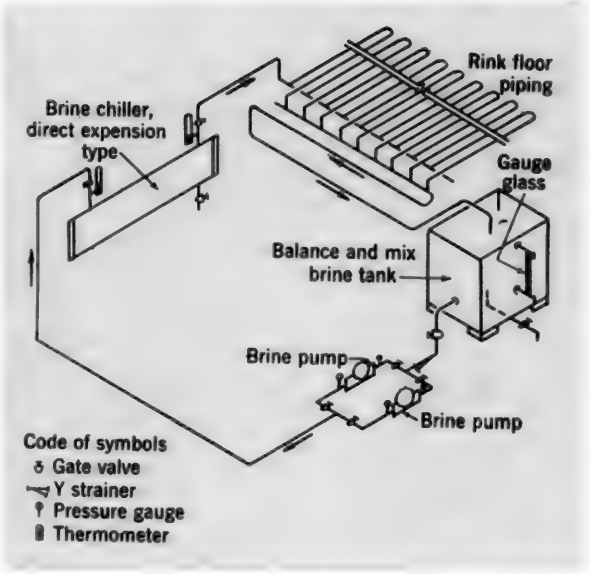



Fig. 16. Schematic brine cycle diagram

## Brine Solutions

Calcium chloride brine, generally used as the freezing medium for ice skating rinks, is mixed to a specific gravity of 1.23 at 60 deg. Commercial flake calcium chloride is used which has an average purity of 78 to 80%. The solution is prepared by mixing about 3½ lb of the flake per gallon of water which results in about a 25% by weight solution. This solution weighs 10.25 lb per gallon, has a density of 76.6 lb per cu ft resulting in 7.50 gal per cu ft.

Quantity of brine for the system can be calculated by figuring the internal volume of the piping plus the free volume of the direct expansion chiller shell (this is usually listed in chiller specifications) or the internal volume of the tubes in a flooded chiller. About 10% should be added for fittings and valves. See Table 6.

## Gas Absorption

Exposure to air will cause the brine to gradually absorb carbon dioxide which tends to neutralize it and make it slightly acid. Acids of course will corrode the metals in the brine system. To stop this tendency of the brine to turn to acid, a corrosion inhibitor is used. Sodium bichromate together with caustic soda will help keep the alkalinity of the brine. About 50 pounds of commercial sodium bichromate dissolved in about 10 gallons of water plus about 15 pounds of caustic soda, well stirred until dissolved, will make enough inhibitor to treat 3,750 gallons of brine.

On freshly prepared brine, it is not necessary to add the caustic soda to the sodium bichromate unless there is a necessity for adjusting the pH value.

## Brine Tank

Today the brine tank is not used to store reserve refrigeration capacity as it was in the original ice rink days. The first rinks were built using an open brine tank in which pipe coils were immersed and the refrigerant expanded into the pipe coils. With the shell and tube chill-

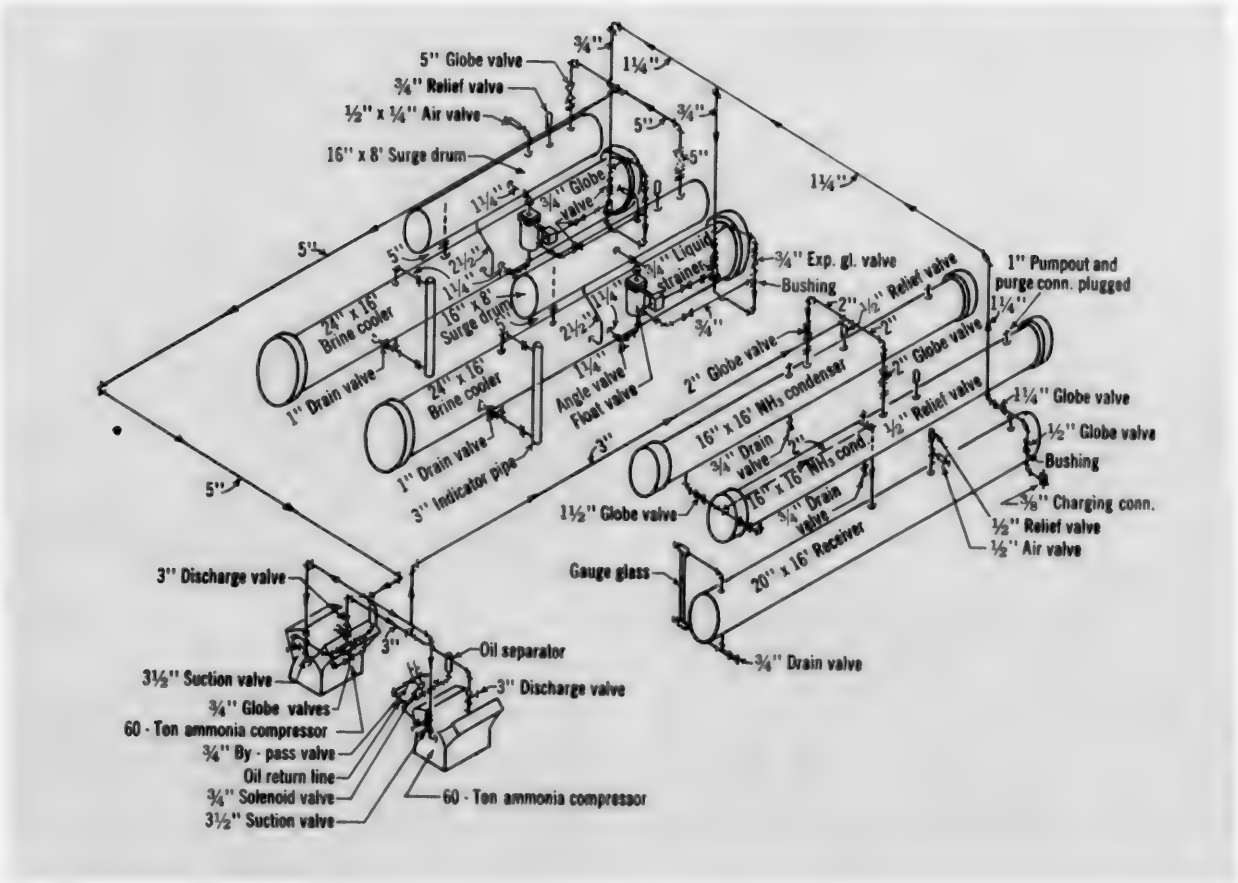



Fig. 17. Schematic ammonia refrigerant cycle diagram.

ers, practice has proven that reserve capacity should be put into the refrigeration equipment.

Brine tanks are still used, however, but serve a different purpose. They are used as balance tanks, and as mixing tanks for the brine. Two separate tanks may be used, but a combination tank serving both purposes is recommended. The tank should be located so that the operating brine level in it is at the highest point in the system. The bottom of the tank should be set so that it is always above the height of the brine pump suction connection. In this manner the brine pumps will always operate on a flooded suction, and keep a constant prime. The tank should be open to the atmosphere and arranged so that the brine returning from the rink piping and return main dumps into the brine tank. See Figs. 16 and 17. There should be a gage glass column on the tank for liquid level check. The quantity of brine in circulation will usually determine the size of the tank if it is to be used as a combination balance and mixing tank. It should, therefore, be large enough to hold as many gallons as is circulated through the system per minute when about ¾ full. For a circulation of 1000 gpm, therefore, the brine tank should hold 1000 gallons when ¾ full. This is equivalent to 1330 gallons when full for a volume of 177 cu ft. A tank 6 ft square by 5 ft high would fill this requirement. Overflow and drain connections should be provided. The tank should be constructed of ¼ in. steel plate and covered inside and out with rust resistant paint. The outside surfaces should be insulated with 2 to 3 in. insulation board as previously described.

## Auxiliary Equipment

A heating system should be installed to heat the machinery room to prevent freezing of the water lines. Hot water for ice resurfacing must be made available through a hot water heater or generator. A cold water service line is necessary for various maintenance needs and to supply cold water for spraying the rink. A snow pit should be placed at one end of the rink large enough to handle the scraped off snow, or planed ice, or for complete ice removal. Other equipment required includes: Sufficient hose preferably 1 in. size, a fine spray nozzle, a power ice planer or resurfacer, a tractor to pull the planer, a set of snow pushers with steel edges, a set of three or four squeegees 5 or 6 ft long, and a rubber-tired hot water cart for resurfacing the planed ice surface.

## Drip Problem

In the early fall and late spring, some indoor rinks where little or no internal heat load exists, may be plagued with drip from condensate dropping from the roof and roof truss members, and by fog forming over the ice. This can be eliminated by installation of dehumidifying equipment. Brine from the rink floor can be piped to the equipment to supply the dehumidification capacity. Curling rinks are not apt to be harassed by the condensation because they have little or no internal heat load since the number of persons per square foot of ice surface is low and there are few spectators to supply reheat. Ventilation and reheat supplied by spectator body heat usually

halts this troublesome condition in the larger arena type rinks.

### Flood Lighting

For night skating or evening ice sports contests on outdoor rinks, it is advisable to install floodlights on suitable supports outside the rink area. Each floodlight should be approximately 1500 watts in capacity. Sixteen lights providing 24.000 watts will supply ample lighting for an average size rink. This amount of lighting will usually handle school night hockey. Three watts of lighting per square foot of ice surface will usually supply sufficient illumination for any evening sports contest. Arrangement should be made in the wiring so that for recreational or public skating, only half of the lights that are installed may be used.

### Operation

The rink and ice should be kept in top condition. Wet ice, for example will damage clothing when people fall upon it, and rough ice will make people lame and tired. The ice should be in such condition that a thin film of moisture forms when the skater passes over it. This moisture film lubricates the skate runner and prevents the ice from being cut and roughed.

The ice surface temperature for pleasure or public skating should be about 30 deg, and at a thickness of 1 to 1¼ in. Beyond this thickness, the floor is expensive to maintain during warmer weather, or with a large attendance. For hockey and other sporting events, the ice surface temperature should be about 25 deg and at a thickness of ½ to ¾ in. The lower temperature ice is the "harder" ice, and the higher temperature ice is the softer ice. It is apparent, therefore, that the ice temperature and hardness may be controlled by the brine temperature. The rink equipment operator, after a little experience, can do an effective job of ice hardness control by proper setting and operation of the refrigeration equipment and its controls. For concrete permanent floors, the temperature gradient for two ice conditions are shown graphically in Fig. 18.

In the preparation of the floor for the ice surface, the brine is circulated by the brine pumps at temperatures as low as 5 deg. through the floor piping to cool the whole floor mass to a temperature which will freeze the water. Ice is best made by repeated sprayings of water, each frozen down before the next spraying. On a good cold floor, a quarter of an inch of water may be sprayed on when the surface is first started.

Condensed moisture frozen on the ice surface gradually adds to the ice thickness as does light rain on outdoor rinks, and continued sprayings after snow removal. For this reason the ice must be planed and resprayed to bring it back to the proper condition.

### Quick Estimating Figures

To enable the designer to prepare a budget figure for estimating purposes to present to a prospective customer, the writer has put down a few figures which will prove valuable and time saving in advance of actual load calculation, equipment selection and rink design. The following figures apply to permanent, single purpose, or take-up floors, and for calcium chloride brine circulation systems using ammonia or Freon-22 as the refrigerant:

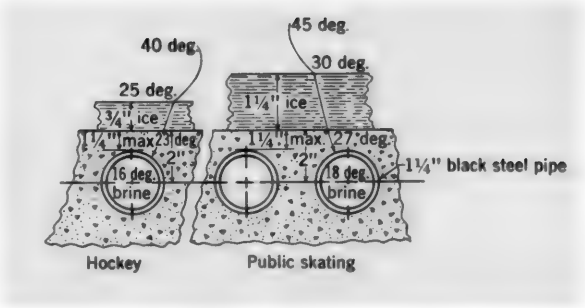



Fig. 18. Temperature gradient sketch, rink floor.

| | |
|---|---|
| Nominal rink size: | 85 ft x 185 ft for general public pleasure skating. |
| Capacity required: | About one-ton refrigeration per 200-250 sq ft of ice surface at 50 deg w.b. ambient air. Rink partially shaded. |
| Compressor conditions of service: | Ammonia: 22.5 psig back pressure and 185 psig head pressure. |
| | Freon-22: 5 deg suction temperature at compressor and 95 deg condensing temperature. |
| Compressor selection: | Two compressors both running on pulldown, then one running on holding. No pulldown time considered, 50% capacity control both machines. |
| Compressor horsepower: | 1.5 Bhp per ton of refrigeration for $NH_3$. 1.5 Bhp per ton of refrigeration for F-22. |
| Condenser size: | 6 to 7 sq ft prime surface per ton of refrigeration based on 1½ to 2 Gpm per ton of refrigeration using 75 deg water. |
| Receiver size: | 0.33 cu ft storage capacity per ton of refrigeration. |
| Brine chiller: | Flooded for ammonia; 9 to 10 sq ft of prime surface per ton of refrigeration. Brine flows in steel tubes. |
| | Direct expansion for F-22; 16 to 17 sq ft of effective tube area per ton of refrigeration. Brine in shell, steel tubes. |
| Brine tank (combination balance and mixing.) | 0.133 cu ft of volume per gallon of brine circulated. |
| Surge drum: | Ammonia only; 0.135 cu ft internal volume per ton of refrigeration. |

| | |
|---|---|
| Brine: | Calcium chloride (S.G. 1.23; S.H. 0.68). 25% solution by weight. |
| Brine rate: | 9.66 gpm per ton of refrigeration cooled 3 deg. |
| Brine range: | 17 deg to 14 deg (0.5 deg rise chiller to rink, 2 deg rise in rink piping, 0.5 deg rise rink to chiller). |
| Brine pump: | Select for gpm of brine through chiller after computing proper total dynamic head. Usually not over 60 ft. |
| Floor piping: | 1¼ in black steel, 4 in on centers, runs along length of rink. |
| Length required: | 3 linear feet per sq ft of ice surface. Hairpin coils in parallel on steel sleepers. |
| | Plastic pipe 1 in nominal, 3 in on centers, runs along length of rink. Pipe is black polyethylene, wall thickness .092 to 0.10 in, bursting pressure 150 psi at 12 deg. About 4 linear feet of pipe per sq ft of ice surface is required. Hairpin coils in parallel on spacer bars. |
| Headers: 3-pipe balanced floor system | 6 to 8 in IPS on both supply and return along width of rink. Floor piping decides header location. |
| Sleepers: | Steel 3 in x ⅛ in, 6 to 8 ft centers and laid parallel to width of rink. Steel spacer supports. |
| Floor: | Leveled, rolled, hard ground, or macadam for take-up rinks. For permanent rinks, sand fill and concrete deck. |
| Price: | "Take-up" rinks: $5 to $6 per sq ft of ice surface. |
| | Concrete deck-type: $7 to $8 per sq ft of ice surface. |
| | For installed refrigeration cycle, brine floor piping, machinery building. |
| Extras: | $.50 to $1.00 per sq ft of ice surface for wire fence enclosure, flood lighting, warming shelter, hockey boards, water supply and drain, flooding and ice-cleaning equipment. |

### Operating Cost and Income

| | |
|---|---|
| Operating cost: (assuming 120 days or four months skating) | About: $.10 per year per sq ft of ice surface for utilities (water, electricity, and heat). |
| | .80 per year per sq ft of ice surface for labor (caretaker, operator, and extras). |
| | Total $.90 per sq ft of ice surface total operating cost. |
| For 85 ft x 185 ft rink, therefore: | $14,000 is total operating cost. |
| Suggested operating income: (assuming 120 days or four months skating and 60 free days for children) | 300 children per day at $.25 x 60 days = $4,500.00<br>200 adults per day at $.60 x 120 days = 14,400.00<br>$18,900.00 Total Revenue |

The figures presented are average ones and will fluctuate up or down in accordance with local conditions.

In this article, the writer has endeavored to go into detail, as much as space would allow, on all phases of ice rink design. The designs and interpretations contained herein are not, by far, the only existing ones, but do represent the latest trend in modern engineering and the design of rinks being constructed today.

# PROPERTIES OF FREON-12

Dichlorodifluoromethane ($CCl_2F_2$), a halogen derivative of methane, is a colorless gas, heavier than air (specific gravity = 4.26). At ordinary temperatures it is a liquid when under a pressure of 75 lb. per sq. in. gage. This refrigerant, sold by Kinetic Chemicals Division of E. I. du Pont de Nemours & Co., Inc., under the trade name Freon-12, is widely used for comfort air conditioning.

The extended table of thermodynamic properties of saturated Freon-12 which follows is a new one copyrighted by the makers in 1955 and 1956. The original tables were issued in 1931 and added to in 1942 and subsequently. The new tables are more consistent, based on additional experimental measurements, and calculated from equations which apply throughout the whole range of temperature, density, and pressure. The complete tables cover the range from −152 deg F to 233.6 deg; the data which follow begin at −40 deg.

Characteristics of Freon-12, based on the new data, including the characteristics at an evaporator temperature of 5 deg and a condenser temperature of 86 deg, the conventional temperatures for the standard ton, are given in the table below.

## Characteristics of Freon-12

| | |
|---|---|
| Compression ratio, 86 deg/5 deg | 4.08 |
| Net refrigerating effect, Btu per pound | 50.035 |
| Refrigerant circulated per ton, pound per minute | 3.9972 |
| Refrigerant liquid circulated per ton, cubic inches per minute | 85.621 |
| Compressor displacement per ton, cubic feet per minute | 5.8279 |
| Refrigeration per cubic foot of compressor displacement, Btu | 34.318 |
| Heat of compression, Btu per pound | 10.636 |
| Temperature of compressor discharge, deg F | 100.84 |
| Coefficient of performance | 4.704 |
| Horsepower per ton | 1.0023 |
| Critical pressure, pound per square inch absolute | 596.9 |
| Critical temperature, deg F | 233.6 |
| Critical volume, cubic feet per pound | 0.0287 |
| Molecular weight | 120.93 |
| Melting point, deg F | −252 |
| Boiling point, deg F | −21.62 |
| Flammability | Nonflammable and Noncombustible |
| Toxicity | Very low—Group 6 |

| | At 86 deg F | At 5 deg F |
|---|---|---|
| Pressure, pound per square inch absolute | 26.483 | 108.04 |
| Latent heat of vaporization, Btu per pound | 58.052 | 68.204 |
| Net refrigerating effect, Btu per pound | 50.035 | 51.07 |
| Specific volume, liquid, cubic feet per pound | 0.0124 | 0.01109 |
| Specific volume, vapor, cubic feet per pound | 0.3766 | 1.4580 |
| Heat of liquid, Btu per pound | 27.769 | 9.6005 |
| Heat in vapor, Btu per pound | 85.821 | 77.805 |
| Entropy, liquid, Btu per pound per degree | 0.05730 | 0.02165 |
| Saturated density of vapor, pound per cubic foot | 2.6556 | 0.68588 |
| Specific heat, liquid | 0.235 | 0.216 |
| Specific heat, vapor ($C_p$), 1 atmosphere | 0.1482 | 0.1398 |
| Specific heat, vapor ($C_v$), 1 atmosphere | 0.1302 | 0.1202 |
| Specific gravity, liquid (water = 1) | 1.292 | 1.442 |

## SATURATION PROPERTIES OF FREON-12

| Temperature, Deg. F. | Pressure, Lb. per Sq. In. | | Volume, Cu. Ft. per Lb. | | Density, Lb. per Cu. Ft. | | Enthalpy, Btu per Lb. | | | Entropy, Btu per Lb. per Deg. Abs. | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Abs. | Gage | Liq. | Vapor | Liq. | Vapor | Liq. | Latent | Vapor | Liq. | Vapor |
| −40 | 9.3076 | 10.9709* | 0.010564 | 3.8750 | 94.661 | 0.25806 | 0 | 72.913 | 72.913 | 0 | 0.17373 |
| −39 | 9.5530 | 10.4712* | 0.010575 | 3.7823 | 94.565 | 0.26439 | 0.2107 | 72.812 | 73.023 | 0.000500 | 0.17357 |
| −38 | 9.8035 | 9.9611* | 0.010586 | 3.6922 | 94.469 | 0.27084 | 0.4215 | 72.712 | 73.134 | 0.001000 | 0.17343 |
| −37 | 10.059 | 9.441* | 0.010596 | 3.6047 | 94.372 | 0.27741 | 0.6324 | 72.611 | 73.243 | 0.001498 | 0.17328 |
| −36 | 10.320 | 8.909* | 0.010607 | 3.5198 | 94.275 | 0.28411 | 0.8434 | 72.511 | 73.354 | 0.001995 | 0.17313 |
| −35 | 10.586 | 8.367* | 0.010618 | 3.4373 | 94.178 | 0.29093 | 1.0546 | 72.409 | 73.464 | 0.002492 | 0.17299 |
| −34 | 10.858 | 7.814* | 0.010629 | 3.3571 | 94.081 | 0.29788 | 1.2659 | 72.309 | 73.575 | 0.002988 | 0.17285 |
| −33 | 11.135 | 7.250* | 0.010640 | 3.2792 | 93.983 | 0.30495 | 1.4772 | 72.208 | 73.685 | 0.003482 | 0.17271 |
| −32 | 11.417 | 6.675* | 0.010651 | 3.2035 | 93.886 | 0.31216 | 1.6887 | 72.106 | 73.795 | 0.003976 | 0.17257 |
| −31 | 11.706 | 6.088* | 0.010662 | 3.1300 | 93.788 | 0.31949 | 1.9003 | 72.004 | 73.904 | 0.004469 | 0.17243 |
| −30 | 11.999 | 5.490* | 0.010674 | 3.0585 | 93.690 | 0.32696 | 2.1120 | 71.903 | 74.015 | 0.004961 | 0.17229 |
| −29 | 12.299 | 4.880* | 0.010685 | 2.9890 | 93.592 | 0.33457 | 2.3239 | 71.801 | 74.125 | 0.005452 | 0.17216 |
| −28 | 12.604 | 4.259* | 0.010696 | 2.9214 | 93.493 | 0.34231 | 2.5358 | 71.698 | 74.234 | 0.005942 | 0.17203 |
| −27 | 12.916 | 3.625* | 0.010707 | 2.8556 | 93.395 | 0.35018 | 2.7479 | 71.596 | 74.344 | 0.006431 | 0.17189 |
| −26 | 13.233 | 2.979* | 0.010719 | 2.7917 | 93.296 | 0.35820 | 2.9601 | 71.494 | 74.454 | 0.006919 | 0.17177 |
| −25 | 13.556 | 2.320* | 0.010730 | 2.7295 | 93.197 | 0.36636 | 3.1724 | 71.391 | 74.563 | 0.007407 | 0.17164 |
| −24 | 13.886 | 1.649* | 0.010741 | 2.6691 | 93.098 | 0.37466 | 3.3848 | 71.288 | 74.673 | 0.007894 | 0.17151 |
| −23 | 14.222 | 0.966* | 0.010753 | 2.6102 | 92.999 | 0.38311 | 3.5973 | 71.185 | 74.782 | 0.008379 | 0.17139 |
| −22 | 14.564 | 0.270* | 0.010764 | 2.5529 | 92.899 | 0.39171 | 3.8100 | 71.081 | 74.891 | 0.008864 | 0.17126 |
| −21 | 14.912 | 0.216 | 0.010776 | 2.4972 | 92.799 | 0.40045 | 4.0228 | 70.978 | 75.001 | 0.009348 | 0.17114 |
| −20 | 15.267 | 0.571 | 0.010788 | 2.4429 | 92.699 | 0.40934 | 4.2357 | 70.874 | 75.110 | 0.009831 | 0.17102 |
| −19 | 15.628 | 0.932 | 0.010799 | 2.3901 | 92.599 | 0.41839 | 4.4487 | 70.770 | 75.219 | 0.010314 | 0.17090 |
| −18 | 15.996 | 1.300 | 0.010811 | 2.3387 | 92.499 | 0.42758 | 4.6618 | 70.666 | 75.328 | 0.010795 | 0.17078 |
| −17 | 16.371 | 1.675 | 0.010823 | 2.2886 | 92.399 | 0.43694 | 4.8751 | 70.561 | 75.436 | 0.011276 | 0.17066 |
| −16 | 16.753 | 2.057 | 0.010834 | 2.2399 | 92.298 | 0.44645 | 5.0885 | 70.456 | 75.545 | 0.011755 | 0.17055 |
| −15 | 17.141 | 2.445 | 0.010846 | 2.1924 | 92.197 | 0.45612 | 5.3020 | 70.352 | 75.654 | 0.012234 | 0.17043 |
| −14 | 17.536 | 2.840 | 0.010858 | 2.1461 | 92.096 | 0.46595 | 5.5157 | 70.246 | 75.762 | 0.012712 | 0.17032 |
| −13 | 17.939 | 3.243 | 0.010870 | 2.1011 | 91.995 | 0.47595 | 5.7295 | 70.141 | 75.871 | 0.013190 | 0.17021 |
| −12 | 18.348 | 3.652 | 0.010882 | 2.0572 | 91.893 | 0.48611 | 5.9434 | 70.036 | 75.979 | 0.013666 | 0.17010 |
| −11 | 18.765 | 4.069 | 0.010894 | 2.0144 | 91.791 | 0.49643 | 6.1574 | 69.930 | 76.087 | 0.014142 | 0.16999 |
| −10 | 19.189 | 4.493 | 0.010906 | 1.9727 | 91.689 | 0.50693 | 6.3716 | 69.824 | 76.196 | 0.014617 | 0.16989 |
| − 9 | 19.621 | 4.925 | 0.010919 | 1.9320 | 91.587 | 0.51759 | 6.5859 | 69.718 | 76.304 | 0.015091 | 0.16978 |
| − 8 | 20.059 | 5.363 | 0.010931 | 1.8924 | 91.485 | 0.52843 | 6.8003 | 69.611 | 76.411 | 0.015564 | 0.16967 |
| − 7 | 20.506 | 5.810 | 0.010943 | 1.8538 | 91.382 | 0.53944 | 7.0149 | 69.505 | 76.520 | 0.016037 | 0.16957 |
| − 6 | 20.960 | 6.264 | 0.010955 | 1.8161 | 91.280 | 0.55063 | 7.2296 | 69.397 | 76.627 | 0.016508 | 0.16947 |
| − 5 | 21.422 | 6.726 | 0.010968 | 1.7794 | 91.177 | 0.56199 | 7.4444 | 69.291 | 76.735 | 0.016979 | 0.16937 |
| − 4 | 21.891 | 7.195 | 0.010980 | 1.7436 | 91.074 | 0.57354 | 7.6594 | 69.183 | 76.842 | 0.017449 | 0.16927 |
| − 3 | 22.369 | 7.673 | 0.010993 | 1.7086 | 90.970 | 0.58526 | 7.8745 | 69.075 | 76.950 | 0.017919 | 0.16917 |
| − 2 | 22.854 | 8.158 | 0.011005 | 1.6745 | 90.867 | 0.59718 | 8.0898 | 68.967 | 77.057 | 0.018388 | 0.16907 |
| − 1 | 23.348 | 8.652 | 0.011018 | 1.6413 | 90.763 | 0.60927 | 8.3052 | 68.859 | 77.164 | 0.018855 | 0.16897 |
| 0 | 23.849 | 9.153 | 0.011030 | 1.6089 | 90.659 | 0.62156 | 8.5207 | 68.750 | 77.271 | 0.019323 | 0.16888 |
| 1 | 24.359 | 9.663 | 0.011043 | 1.5772 | 90.554 | 0.63404 | 8.7364 | 68.642 | 77.378 | 0.019789 | 0.16878 |
| 2 | 24.878 | 10.182 | 0.011056 | 1.5463 | 90.450 | 0.64670 | 8.9522 | 68.533 | 77.485 | 0.020255 | 0.16869 |
| 3 | 25.404 | 10.708 | 0.011069 | 1.5161 | 90.345 | 0.65957 | 9.1682 | 68.424 | 77.592 | 0.020719 | 0.16860 |
| 4 | 25.939 | 11.243 | 0.011082 | 1.4867 | 90.240 | 0.67263 | 9.3843 | 68.314 | 77.698 | 0.021184 | 0.16851 |
| 5 | 26.483 | 11.787 | 0.011094 | 1.4580 | 90.135 | 0.68588 | 9.6005 | 68.204 | 77.805 | 0.021647 | 0.16842 |
| 6 | 27.036 | 12.340 | 0.011107 | 1.4299 | 90.030 | 0.69934 | 9.8169 | 68.094 | 77.911 | 0.022110 | 0.16833 |
| 7 | 27.597 | 12.901 | 0.011121 | 1.4025 | 89.924 | 0.71300 | 10.033 | 67.984 | 78.017 | 0.022572 | 0.16824 |
| 8 | 28.167 | 13.471 | 0.011134 | 1.3758 | 89.818 | 0.72687 | 10.250 | 67.873 | 78.123 | 0.023033 | 0.16815 |
| 9 | 28.747 | 14.051 | 0.011147 | 1.3496 | 89.712 | 0.74094 | 10.467 | 67.762 | 78.229 | 0.023494 | 0.16807 |
| 10 | 29.335 | 14.639 | 0.011160 | 1.3241 | 89.606 | 0.75523 | 10.684 | 67.651 | 78.335 | 0.023954 | 0.16798 |
| 11 | 29.932 | 15.236 | 0.011173 | 1.2992 | 89.499 | 0.76972 | 10.901 | 67.539 | 78.440 | 0.024413 | 0.16790 |
| 12 | 30.539 | 15.843 | 0.011187 | 1.2748 | 89.392 | 0.78443 | 11.118 | 67.428 | 78.546 | 0.024871 | 0.16782 |
| 13 | 31.155 | 16.459 | 0.011200 | 1.2510 | 89.285 | 0.79935 | 11.336 | 67.315 | 78.651 | 0.025329 | 0.16774 |
| 14 | 31.780 | 17.084 | 0.011214 | 1.2278 | 89.178 | 0.81449 | 11.554 | 67.203 | 78.757 | 0.025786 | 0.16765 |
| 15 | 32.415 | 17.719 | 0.011227 | 1.2050 | 89.070 | 0.82986 | 11.771 | 67.090 | 78.861 | 0.026243 | 0.16758 |

*Inches of mercury below one atmosphere

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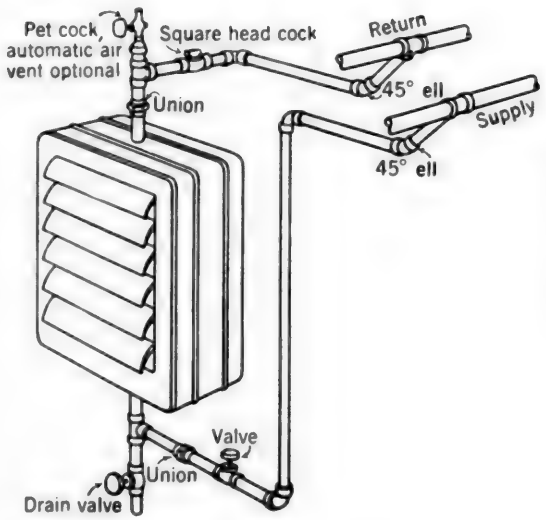
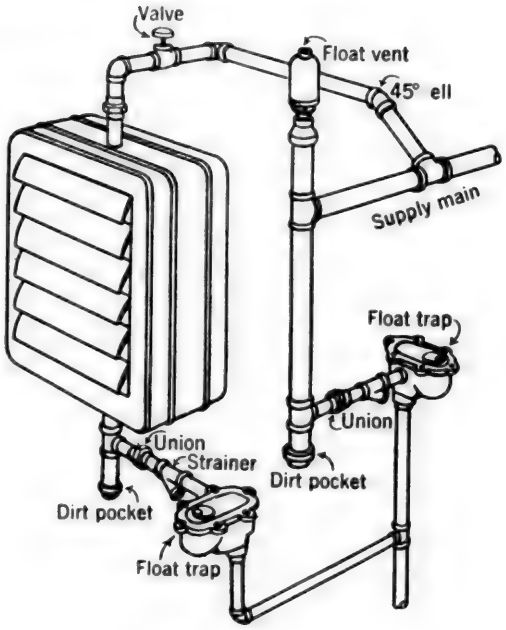
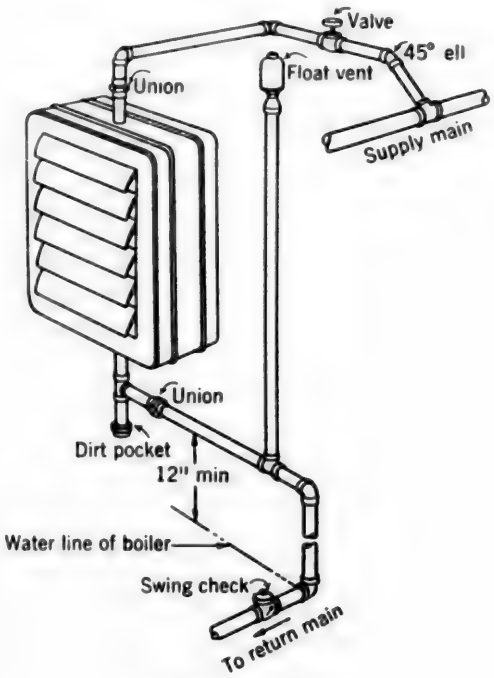
# PIPING FOR UNIT HEATERS



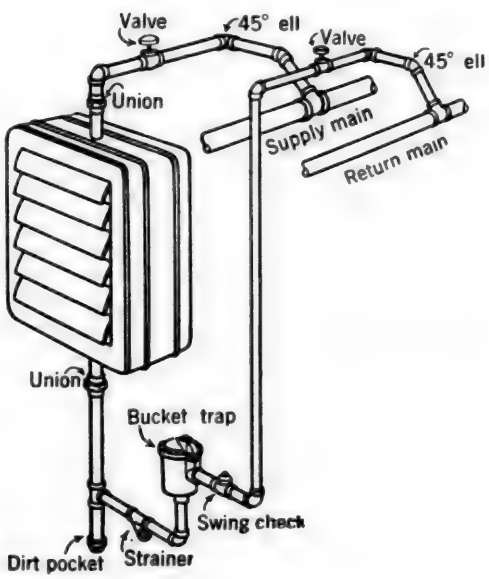

Hot water system with circulating pump




Low pressure or vacuum system

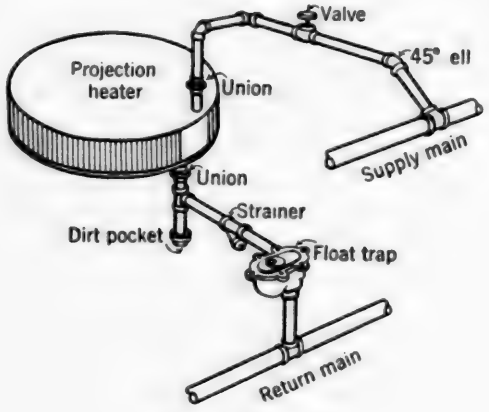



Two pipe steam system

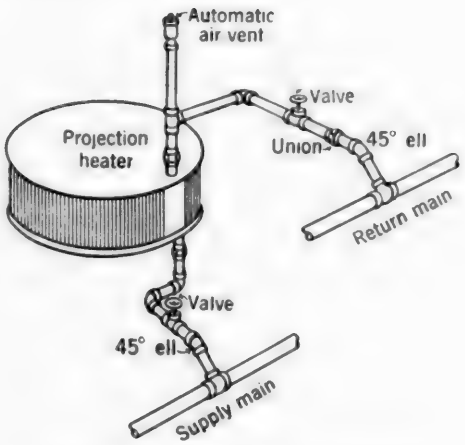



High pressure steam system

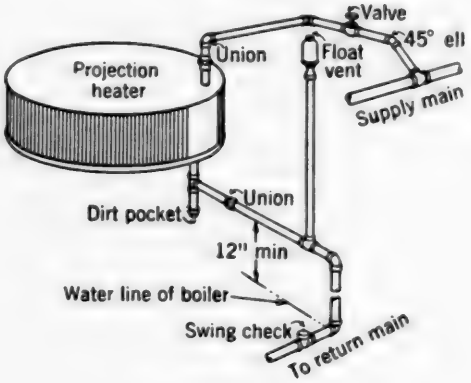
# PIPING FOR PROJECTION HEATERS



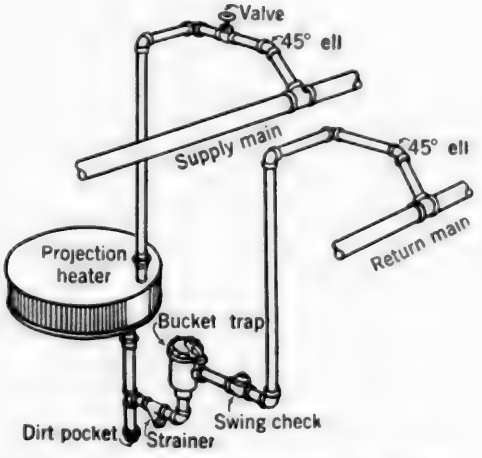

Vapor or vacuum system



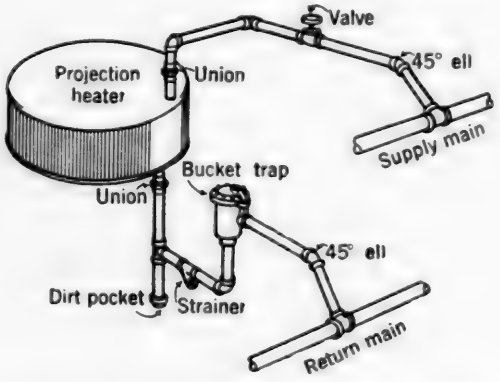

Hot water system with circulating pump




Two pipe steam system




High pressure steam system with overhead supply and return mains




High pressure steam system with lower supply and return mains

DRAWINGS PRESENTED THROUGH COOPERATION OF THE TRANE CO., LA CROSSE, WISC

Below and on the following pages are given brief digests of the advertisements appearing in this month's issue. Use this Digest to locate and refer to the advertisements in which you are particularly interested, then fill out and mail the prepaid postcard to request further information from manufacturers.

The items appear in the same order as the advertisements to which they refer, to facilitate obtaining further information after reading an advertisement. NOTE: All advertisements are digested here except those received too late for inclusion. The Index of Advertisers lists all the advertisements in this issue.

Use the postcard below for catalogs, new equipment and materials, as well as Ad-Digest items.

**UNIT HEATER TRAPPING.** Inside front cover. Advertisement includes a large illustration which represents an outstanding guide to good unit heater trapping. Six points are referred to. Further information available in the company's booklet "How to Trap Unit Heaters," available on request. .....**Item 102**

**INDUCED DRAFT CATALOG.** Page 1. A new induced draft catalog with all boiler ratings expressed in Btu per hr is offered by this manufacturer as a working tool for both the engineer and contractor. Included are tables and charts on volume of flue gas for oil, gas, and coal. Copies are available. .....**Item 103**

**STEAM HEATING SYSTEM.** Page 2. A weather controlled continuous steam heating system that pays for itself in fuel savings is now equipped with electronic controls, assuring winter-long comfort. Information is available. .....**Item 104**

**RELIEF VALVES.** Page 4. A line of automatic reseating pressure-temperature relief valves for commercial, industrial and institutional buildings. For hot water supply systems for these buildings this line is available is ASME rated and certified combination valves, or plain ASME pressure safety relief valves. Specifications given. Folder available. .....**Item 105**

**ALUMINUM INSULATION.** Page 7. Multiple aluminum insulation reduces heat flow by convection upward and laterally by dividing the depth of joist spaces into multiple shallower spaces. A research paper on the thermal insulating value of air spaces is offered by the manufacturer. .....**Item 106**

**CONDENSING UNITS.** Page 9. A complete line of air conditioning condensing units is available from this company as a single source. Units are made from ¼ to 100 hp. Packaged units are also available in four sizes to 10 hp. Information is available. .....**Item 107**

**UNIT VENTILATORS.** Page 11. Manufacturer urges users to look at the record of performance of equipment offered you. Company has more than 150,000 unit ventilators, unit heaters and various types of wall radiation in use in the field. Information available. ...**Item 108**

**AIR MIXING UNITS.** Page 14. Dual mixing units of this company have a self-contained volume control that is automatic and requires no outside connections or source of power. Select the temperature room by room, and it stays constant automatically. Under window and overhead units are made. Information is available. .....**Item 109**

**DRIPPROOF MOTOR.** Page 15. Ventilating air is drawn in at both ends of this company's dripproof motor and exhausts through openings at the bottom of the frame. Other types of enclosures are available where conditions are severe. Booklet is available. .....**Item 110**

**AIR CONDITIONING CONTROL.** Pages 16-17. The air conditioning system of a new office building in Minneapolis is regulated by this company's thermostatic control system. Occupants in each individual space may select the temperature desired. Information is available. .....**Item 111**

**FILTERS.** Page 18. For heavy duty ventilation work the company's dry panel ventilation filter is recommended as being extremely efficient. It operates with any filtering material that comes in sheet form and can be crimped. Preformed elements available for quick and easy replacement when necessary. Ventilating filter catalogs available. .....**Item 112**

**VENTILATING FANS.** Page 19. Ventilating fans are made by this company with an inlet collar and guide vanes to reduce turbulence and simplify duct connections. They are made in capacities to 500,000 cfm. Bulletin is available. .....**Item 113**

**SOUND CONTROL.** Pages 20-21. A 5-ft sound trap replaces 80 ft of ordinary duct lining for controlling air conditioning noise. The units suppress sound in low velocity air conditioning systems and will silence an entire system or selected outlets. Information is available. .....**Item 114**

**COAL-FIRED BOILERS.** Page 22. Two of this company's coal-fired boilers help cut fuel and other plant costs at a North Carolina resort. The boilers replaced five older units to supply steam for all purposes to ten buildings. Information is available. .....**Item 115**

**WATER-SAVING EQUIPMENT.** Page 23. The line of water-saving equipment made by this manufacturer includes copper deck cooling towers, propeller fan condensers, evaporative condensers, blower condensers, and pressure stabilizers. Catalogs containing complete specifications on the units are available. .....**Item 116**

**PLANT HEATERS.** Page 24. Six 2,000,000 Btu per hr heaters made by this company maintain a constant heat level under rapidly changing conditions in a Texas plant. A thermostat mounted in the return air stream cuts off the fan motor and fuel supply at a predetermined temperature. Information is available. .....**Item 117**

**HEATING PUMP BULLETIN.** Page 25. The answers to heating pump problems are offered by this manufacturer in its new pump bulletin. The company manufactures both single and duplex condensate pumps with mechanical shaft seals and a range of discharge pressures. Bulletin is available. ...**Item 118**

**COOLING TOWERS.** Page 26. Vinsynite, vinyl zinc, and chlorinated rubber paint are three protections that are used on this manufacturer's cooling towers. This combination offers protection against corrosion. Details on the line of towers is available. .....**Item 119**

**STAINLESS STEEL VALVES.** Page 27. Stainless steel, Y-globe valves lower costs in a wider range of corrosive services. The Y pattern permits full flow, nearly equal to that of a gate valve. The disc, packing, and gasket are made of Teflon. Stainless steel valve booklet is available. .....**Item 120**

**BOILER SYSTEMS.** Pages 28-29. Rated on nominal capacity, this company's boilers fill normal requirements, yet they can be stepped up to produce additional power for fluctuating loads. They provide for expansion too. Information is available. .....**Item 121**



Circle numbers corresponding to the items and advertisements in which you are interested, print your name and address clearly. Information will be sent directly from manufacturers.

**INQUIRY CARD**

**Circle below item numbers on which you wish catalogs or further information.**

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| 190 | 191 | 192 | 193 | 194 | 195 | 196 | 197 | 198 | 199 | 200 | 201 | 202 | 203 | | | | | | | | |

**PLEASE PRINT** Oct. H-56

This service available only to U. S. and Canadian readers.

**Name** .....**Title** .....

**Firm** .....

**Nature of Firm's Business** .....

**Street** .....

**City** .....**Zone** ....**State** .....

This card is void after Jan. 1, 1957

# Ad-Digest

**GALVANIZED SHEETS.** Page 31. Anything that can be made of steel sheets can be made of the galvanized sheets manufactured by this company because the zinc coating will not chip or crack. Tight crimps and locked seams can be made with the sheets without breaking the coating. Samples and information are available. .....**Item 122**

**AIR FILTERS.** Page 32. Typical of this company's products are 1, 2, and 4-in. thick panel filters, self-washing filters, and grease eliminators. Demonstrations are offered in plants under the particular plant's operating conditions. Information is available. .....**Item 123**

**CENTRIFUGAL PUMPS.** Page 33. Centrifugal pumps are made by this company for cooling tower applications with a vertical split-case design and a mechanical seal. Capacities are available to 1100 gpm and 420 ft head in all-bronze and all-iron and bronze fitted units. Information is available. .....**Item 124**

**VALVES AND FITTINGS.** Page 34. One of this company's valves has a 20-year cost-free record on 400 psi steam at 750 deg F. Thousands of the company's stop-check valves are giving similar service throughout industry. Information is available. .....**Item 125**

**PACKAGED AIR CONDITIONER.** Page 35. Advertisement features support company is giving to its dealers by full color advertising in the Saturday Evening Post. Company has complete, flexible line of packaged units and solicits inquiries from dealers. Information available. .....**Item 126**

**HEATING SPECIALTIES.** Page 38. The line of heating specialties offered by this company includes packless radiator valves, thermostatic radiator traps, vents, bucket traps, and boiler gages. A catalog of all the items in the line is available. .....**Item 127**

**CONDUIT SYSTEMS.** Page 40. Protection for underground piping is provided by the tunnel conduit systems manufactured by this company. Made of vitrified clay, the conduit is available in a wide range of sizes with a line of accessories and fittings. A 4-page brochure is available. .....**Item 128**

**AUTOMATION IN AIR CONDITIONING.** Pages 41 to 44. A 4-page advertisement featuring the Supervisory DataCenter designed so that one man can operate a building's entire air conditioning system from a single panel. It eliminates need for manual floor-by-floor checking, gives central control on every floor, gives better individual room thermostat control, added to which savings liquidate equipment cost. Illustrations include three typical Data-Centers ranging from large to small. Information available. .....**Item 129**

**STEAM GENERATORS.** Page 45. Steam generators are engineered by this company so that all components are matched in size and function to one another. Eighteen sizes are made from 20 to 600 bhp for pressures to 250 psi or for hot water. A catalog with complete details is available. .....**Item 130**

**PIPE-RACKING CHANNELS.** Page 46. A line of channels, clamps, hangers, concrete inserts, and rollers is made by this company for the support of steam, gas, heavy water, light conduit or air conditioning lines. The channels require no drilling, welding or riveting, and the framing is completely adjustable. A 78-page bulletin is available. .....**Item 131**

**DRAFT CONTROLS.** Page 47. This company's draft controls provide both precision and strength. Available in Type M, 6 to 32 inches, for oil and coal plants; type MG, 8 to 32 inches, for gas fired plants; and type RC, 6 to 9 inches, for domestic oil and coal fired plants. Information available. ..**Item 132**

**AIR HANDLING.** Page 48. Air handling equipment for air conditioning and heating and ventilating have been supplied by this company to the first fully air conditioned building owned by the City of Dayton, Ohio. Information is available. .....**Item 133**

**STEAM HUMIDIFIERS.** Page 49. A practical answer to central humidification is offered by this company with its steam humidifier that is connected to discharge into ducts or plenum chambers. Three sizes are available with capacities ranging from 25 to 1280 lb of steam per hr. Selection, installation, and price data are available. ..**Item 134**

**UNIT HEATERS.** Page 52. Vertical and horizontal discharge unit heaters are offered by this company for steam or hot water. The heaters offer lower handling and installation costs and reduced maintenance costs. Bulletin is available. .....**Item 135**

**WELDING FITTINGS.** Between pages 52-53. This manufacturer features this service to speed up your piping jobs. The service includes engineering to simplify design and erection; complete line service whereby the company's complete line including more than 4000 items assures your getting the right fitting for each job, and availability, since the distributor carries local stock for fast delivery. Booklet on allowable working pressures on request...**Item 136**

**WROUGHT IRON PIPE.** Page 53. How wrought iron is giving protection in six corrosive services in a Texas hospital. Services include hot and cold water lines, fire protection lines, high, medium and low pressure steam returns, fuel oil piping and underground condensing water lines. Bulletin available. .....**Item 137**

**STEEL PIPE.** Page 54. The steel pipe offered by this manufacturer has uniform ductility, length, threading, weldability, wall thickness and size, strength and toughness, as well as roundness and straightness. The length specified is the length received. Information is available. .....**Item 138**

**AIR DISTRIBUTION DATA.** Pages 55 to 57. Practical data for selecting the throw of ceiling diffusers, registers and grilles is offered by this company. A complete line of air distribution equipment and accessories for low and high pressure systems is offered. Bulletins are available. .....**Item 139**

**INDUCTION SYSTEMS.** Page 58. High pressure induction air conditioning systems designed by this company offer quiet operation, small ducts, individual room or occupant control, positive ventilation, remote location of mechanical equipment, and flexibility of partition changing. Details of the system are available. .....**Item 140**

**BOILER SAFETY.** Page 59. The basic reason for boiler feeders and low water cut-offs is boiler safety. The significance of these devices is a selling point in the steam and hot water heating fields. This company's new condensed catalog covers practically every condition that can arise. .....**Item 141**

**MOTOR CONTROLS.** Page 60. All the compressors in one modern office building are equipped with this company's motor controls. The solenoid starters have only one moving part and double-break contacts. A 132-page guide to a-c/d-c controls is available. ...**Item 142**

**REFRIGERANTS.** Page 61. This company makes a full line of super-dry refrigerants including monochlorodifluoromethane, dichlorodifluoromethane, dichlorotetrafluoroethane, trichlorotrifluoroethane and trichloromonofluoromethane. Information available. .....**Item 143**

**CENTRIFUGAL FANS.** Page 62. Made in two types, standard and heavy duty. Housing dimensions the same but have different performance characteristics. Forward curve wheels from 7½ to 73 inches. Quiet operating, medium speed wheels with wheel diameters from 15 to 73 inches. Line features all welded housing. Bulletins available. ...**Item 144**

**AIR FILTERS.** Page 63. Air filters made by this manufacturer help control the atmosphere and lower air conditioning cost at a world famous research institute. The filters are used for three months in the air conditioning system to prevent dust build-up in electrostatic precipitators. Information is available. .....**Item 145**

**CEILING AIR CONDITIONERS.** Page 64. Ceiling air conditioning units made by this company heat and ventilate a new 13,500-seat coliseum in North Carolina. The units have a combined capacity of 336,800 cfm. Information is available. .....**Item 146**

**BALL BEARINGS.** Page 65. Ball bearings in rubber cylindrical cartridges are made by this company for air conditioning and heating equipment. Cartridges are available to interchange with other makes, while other cartridges are available to fit sleeve bearing brackets. A 6-page bulletin with dimensions and load ratings is available. .....**Item 147**

**DRAIN PIPE.** Page 66. Acid-proof drain pipe is manufactured by this company of high silicon iron drain line material for corrosion resistance when handling all acids and other corrosives. A complete stock of pipe and fittings is offered. Information is available. **Item 148**



Postage Will be paid by Addressee

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BUSINESS REPLY CARD

FIRST CLASS PERMIT NO. 53, SEC. 34.9, P. L. & R., NEW YORK, N. Y.

AIR CONDITIONING, HEATING AND VENTILATING

93 WORTH STREET

NEW YORK 13, N. Y.

AD-DIGEST SERVICE

# Ad-Digest

**COOLING SERVICE.** Page 68. Engineering service offered by this manufacturer of air conditioning and refrigeration equipment includes surveys, sales-engineering, design, manufacture, shipment, installation and maintenance. Literature and estimates are available. .....**Item 149**

**COPPER TUBE.** Page 69. Architects, builders, and contractors recognize the carton this company's copper tube is packed in as a symbol of the service provided by the company from mill to distributor to contractor. The company makes tubing and only tubing. Information is available. .....**Item 150**

**MOTOR LINE.** Page 70. A complete motor line is offered by this company through more than 200 franchised outlets. Distributors can deliver a motor in a matter of hours. Funds and warehouse space need not be tied up with spare motors and parts. Information is available. .....**Item 151**

**CAST IRON GAS BOILERS.** Page 72. Cast iron gas boilers are offered by this company for hot water heating systems with inputs to 225,000 Btu per hr and for steam and hot water with inputs to 5,000,000 Btu per hr. They burn all gases and are built to ASME Code with AGA approval and IBR ratings. Literature is available. .....**Item 152**

**CONDENSING UNITS.** Page 73. This manufacturer of refrigerating compressors and condensing units has hundreds of thousands of units in operation and over 500 manufacturers of air conditioners and similar equipment using its product. Information is available. .....**Item 153**

**AIR FILTERS.** Page 129. An air filter engineer discusses which air filter deserves a gold watch; the air filter business; and the danger of spraying adhesive on an air filter. Information is available. .....**Item 154**

**HIGH VELOCITY UNITS.** Page 135. Conditioned air is supplied to the Price Tower through continuous straight line diffusers made by this company. Round, square, and straight line diffusers with high velocity units are adaptable to a variety of architectural designs. Booklet is available. .....**Item 155**

**STEAM BOILERS.** Page 137. Sixty-nine of this company's boilers are used by the country's leading dairy associations. Boilers are made in 110 models, 18 sizes from 15 to 600 hp—oil, gas, and combination oil and gas fired—for heating, processing, and cleaning. Information is available. .....**Item 156**

**DUCT TURNS.** Page 139. Multiple-radius vanes are made by this company for minimum noise and maximum efficiency of air movement in square duct turns. Assemblies in sizes 48 x 48 in. are available. Specific sizes are also made. Specifications are available. ....**Item 157**

**COPPER WATER TUBE.** Page 141. Color-coded copper water tube which can be identified in a twinkling. Markings spaced every 12 inches run the full length of the 20 ft. tubes. Five types of color coding are available. Cartons in which coiled tubes are shipped are also being stamped with the new color coding identifications. .....**Item 158**

**AIR DIFFUSERS.** Page 142. Slotted air diffusers are made of extruded aluminum in modules of 2, 3, 4, or 6 ft by this company. Square diffusers are made of pressed steel with an aluminum finish in capacities from 50 to 1250 cfm. Performance and selection data are available. .....**Item 159**

**HEATING PUMPS.** Pages 142-143. Condensation pumps are made by this company in single and duplex units with ratings to 150,000 sq ft EDR. Vacuum pumps are also made in single and duplex units with ratings to 100,000 sq ft EDR. Information is available. .....**Item 160**

**HIGH VELOCITY AIR FILTERS.** Page 143. This filter media has special hemmed edges for strength and safe, easy handling. They have a maximum efficiency from 288 to 510 fpm. Low velocity and grease filters are also made. Catalogs available. .....**Item 161**

**FIRE PROTECTION.** Pages 144-145. Interior fire protection equipment is designed by this company to suit individual projects. The equipment avoids waste of cost, time, and space. Data on components, cabinets, and systems are available. .....**Item 162**

**TWO-STAGE CONTROLS.** Page 146. Two-stage pressure or temperature control problems can be solved with this company's dual purpose controls, incorporating a single element operating two separate independently adjustable, magnetic switches. Bulletin is available. .....**Item 163**

**STEAM LINE INSULATION.** Page 147. One Midwest manufacturer chose this company's hot underground pipe insulation for its steam lines. The insulation provides three zones of protection against heat loss and needs no housing or sheaths. It is made for three temperature ranges. Details are available. .....**Item 164**

**DUCT INSULATION.** Pages 148-149. There is a big saving in heat loss or heat gain due to superior efficiency of this insulation of the glass fiber type. Company also makes a duct liner, an outstanding acoustical product designed to silence duct noise. List of 66 of the company's distributors are listed for easy reference. .....**Item 165**

**DISCHARGE FAN.** Page 149. A vertical discharge fan which moves air at high velocity to keep fumes from leaking back into the building through openings. Designed specifically for industrial applications requiring large volume and high velocity. Has automatic wing dampers. Available with direct or indirect drive. Literature available. .....**Item 166**

**CENTRAL HEATING SYSTEMS.** Page 151. Central heating systems are manufactured by this company with individual room control for hospitals, institutions, hotels and motels, schools, office, buildings, and apartment houses. In one installation steam costs were cut 49.5%. Literature is available. .....**Item 167**

**HOT WATER HEATERS.** Page 155. Six of this company's cement-lined, hot water storage heaters and expansion tanks supply hot water to two large public housing projects. Other types of corrosion resistant linings are also available. Catalogs are available. ..**Item 168**

**HEATER DATA.** Page 156. The latest data on direct-fired heaters is offered by this company for solving space heating and ventilating problems. The company's line of heaters includes 6 models, 66 sizes from 400,000 to 2,000,000 Btu per hr for gas, oil, and combination fuels. Six-page brochure with specifications and dimensional data is available. .....**Item 169**

**VIBRATION CONTROL.** Page 158. A 530-ton centrifugal refrigeration machine is installed on the roof of an office building with the use of this company's steel spring vibration isolators with adjustable leveling bolts. The isolators allow more rentable space. Bulletin is available. .....**Item 170**

**COPPER WATER TUBE.** Page 159. Copper tube and copper solder-joint fittings made by this company were used in the snow removal system installed by a utility company. The tube comes in long lengths that are bent into position and require fewer joints. Tube and fittings expand and contract as one unit. Information is available. .....**Item 171**

**STRIP AIR DIFFUSERS.** Page 160. The strip air diffusers made by this company combine the features of both slots and air diffusers to provide equalized air flow throughout the entire length. The slot diffusers can be located in walls, ceilings, coves, moulds, window reveals, and stools. Catalog is available. .....**Item 172**

**STEAM TRAPS.** Page 161. A steam trap made by this company was replaced after 47 years of service by one of its new float and thermostatic traps. Traps for low and medium pressure steam are made from 15 psi to 25 in. of vacuum in sizes from ¾ to 2 in. Bulletin is available. .....**Item 173**

**AIR CONDITIONING EQUIPMENT.** Page 162. One of seven complete lines of year-round air conditioning equipment offered by this manufacturer includes recessed room units and recessed console models. Literature is available. .....**Item 174**

**IRON BODY GATE VALVES.** Page 163. Iron body gate valves are manufactured by this company with screwed or flanged ends. Among their features are straight-flow port design, seat rings screwed into the body, brass liner on glands and a solid web type disc. Bulletin is available. .....**Item 175**



**Circle numbers corresponding to the items and advertisements in which you are interested, print your name and address clearly. Information will be sent directly from manufacturers.**

## INQUIRY CARD

**Circle below item numbers on which you wish catalogs or further information.**

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| 190 | 191 | 192 | 193 | 194 | 195 | 196 | 197 | 198 | 199 | 200 | 201 | 202 | 203 | | | | | | | | |

**PLEASE PRINT** Oct. H-56

This service available only to U. S. and Canadian readers.

**Name** .....**Title** .....

**Firm** .....

**Nature of Firm's Business** .....

**Street** .....

**City** .....**Zone** ....**State** .....

This card is void after Jan. 1, 1957

# Ad-Digest

**MOISTURE CONTENT CONTROL.** Page 164. This air conditioning method dries air directly by using a moisture-absorbing liquid spray. It makes humidity control a separate function from lowering or raising temperatures and saves the refrigeration used to condense moisture. It also makes re-heat unnecessary in most cases. Bulletins are available. .....**Item 176**

**FAN VENTILATORS.** Page 165. Fan ventilators are offered by this company with V-belt or direct drives for schools, hospitals, and public, commercial and industrial buildings. Certified capacities range from 408 to 36,430 cfm. Centrifugal wheels are backward curved blade in non-overloading design. Data book is available. .....**Item 177**

**PREFABRICATED PIPING.** Page 167. A complete line of prefabricated piping systems for overhead or underground use shipped directly to the job site, timed to your schedule. Made in four types. Catalog available. .....**Item 178**

**GAS BURNERS.** Page 168. This line is recommended when you have a job that calls for a forced-draft gas burner. Illustrated is one with a capacity of 100,000 to 5,400,000 Btu per hr. It comes in 7 sizes. Features include non-pulsating flame and explosion-free circuit. Bulletin available. .....**Item 179**

**GAS UNIT HEATERS.** Page 168. Initial cost of this company's gas unit heaters are low. There are no registers or radiators, no expensive piping or duct work to buy. Each heater operates independently. Catalog is available. ...**Item 180**

**STEAM BOILERS.** Page 169. Two boilers are offered by this company. A package boiler for capacities to 40,000 lb per hr, burning oil or gas. The other, for stoker firing, is available for capacities from 10,000 to 60,000 lb per hr. Catalogs on each boiler are available. .....**Item 181**

**REFRIGERANT INDICATORS.** Page 170. Refrigerant indicators are made by this company in six sizes from ⅜ to 1⅜ in. ODS. They have a preformed copper extension that eliminates the need for separate gaskets. Catalog is available. .....**Item 182**

**INDUCED DRAFT FANS.** Page 170. These fans are said to be better made, more flexible and with large reserve capacity so that user can save up to 35% in installing costs with smaller chimney flue and less costly breeching. Simplified selection data available. **Item 183**

**AIR VELOCITY METER.** Page 170. A manufacturer of air distribution products recommends this company's air velocity meter for precision airflow readings. The portable, direct-reading meter has an assortment of jets and fittings for all velocity measurements. Bulletin is available. .....**Item 184**

**DUCT INSULATION.** Page 171. Vinyl-faced duct insulation is made by this company to be wrapped around ducts, providing both thermal insulation and vapor barrier. It is available with vinyl and other plain or reflective facings, extended beyond edges to form tabs. Information is available. .....**Item 185**

**FLOATS.** Page 172. This company is prepared to solve liquid level control problems involving floats and provides complete technical data on types, sizes and suitable metals for floats depending on conditions. Made in a variety of metals in sizes from 2½ to 14 inches. Catalog available. .....**Item 186**

**CAREER OPPORTUNITIES.** Page 172. Opportunities are offered by this company to district managers with experience in distributor-wholesaler sales of residential heating and commercial and residential air conditioning. Opportunities are also offered to field service representatives. Information is available. .....**Item 187**

**PACKAGED BOILERS.** Page 173. Packaged, automatic boilers are made by this company in a range from 20 to 500 hp with a guaranteed 80% efficiency, two-pass design, and access to furnace and all return tubes. Refractory baffles and brickwork are not required. Bulletin is available. .....**Item 188**

**SCOTCH BOILERS.** Page 174. Scotch boilers are offered by this company for packaged heating units. The area of the boiler directly exposed to the radiant heat of combustion is a large percentage of the total heating surface. Ratings are moderate but extra loads can be handled with larger burners. Information is available. .....**Item 189**

**HEATERS.** Page 174. Direct fired, warm air heaters are made by this company in a full range of sizes for gas, oil, or gas-oil firing. A gas-fired, infra radiant heater is also made by the company for commercial and industrial heating. Bulletins are available. **Item 190**

**AIR FILTERS.** Page 175. An electrostatic type air filter from which dust and dirt can be washed quickly. The filter never has to be replaced, outlasts 50 throw-away filters. Information available. .....**Item 191**

**CONDENSATE PUMPS.** Page 175. Condensate pumps are offered by this company for low pressure systems in capacities from 500 to 10,000 sq. ft. EDR. Single and duplex units are available with low return connections, low speeds, cast iron receivers, low water lines, and float switch controls. Bulletin with specifications is available. ....**Item 192**

**DIRECT DRIVE VENTILATORS.** Page 176. Spun aluminum, direct drive ventilators, with rubber mounting, are available from this manufacturer in speeds as low as 490 rpm. Two ventilators are available with capacities from 300 to 9200 and 300 to 2100 cfm. Wall ventilators and belt drive centrifugal ventilators are also available. Catalog is offered. .....**Item 193**

**SHUTTERS.** Page 176. A line of automatic shutters, back draft shutters, hand-operated shutters, automatic ceiling shutters for all types of air conditioning and ventilating. Circular and prices available. .....**Item 194**

**AIR METER.** Page 176. This company offers a bulletin on its air meter, a device which saves in balancing air condition and ventilating systems. It puts at your fingertips, by color-coded push-buttons, air velocity, air temperature and static pressure. Bulletin available. .....**Item 195**

**ELECTRIC HEATING.** Page 176. New application information on the uses of electric heating equipment for winter weather problems is given in a book offered by this manufacturer. Factual reports give solutions to problems on room heating, snow melting, de-icing, or warming materials. .....**Item 196**

**PACKLESS EXPANSION JOINTS.** Page 177. Packless expansion joints are made by this manufacturer with equalizing rings to absorb four different motions. The company's engineering experience is applied to every pipe problem presented to it. Bulletin is available. .....**Item 197**

**COMBUSTION TEST KIT.** Page 177. A complete combustion efficiency test can be made in 30 seconds with this test kit which includes $CO_2$ draft gage, stack thermometer, smoke gage, slide rule computer, clips, instructions and necessary fittings. Information is available. .....**Item 198**

**SPRAY NOZZLES.** Page 177. A selection of types and sizes of standard industrial spray nozzles is offered by this manufacturer. A comprehensive, 48-page catalog of spray nozzles is available. .....**Item 199**

**FUEL OIL HEATER.** Page 178. This company's fuel oil heater delivers really hot oil. Features include 100% true counter flow; a heat transfer liquid between the tubes eliminates need for electric warning systems; extended tube surface, and no electric wiring. Available in 5 sizes. Bulletin available. .....**Item 200**

**OIL SEPARATOR MUFFLER.** Page 179. Oil separation and system silencing have been engineered into a single unit by this manufacturer. Constructed to ASME specification, the units are available in capacities from 1 to 75 tons F-12 and 1 to 100 tons F-22. Catalog is available. .....**Item 201**

**RADIANT CEILING.** Page 180. A radiant acoustical ceiling providing in one integrated unit heating, cooling, ventilation, humidity control, noise reduction and lighting. Booklet with details and design data available. .....**Item 202**

**CONTROLS.** Back cover. This company's pneumatic controls are a must when the temperature and humidity requirements are diversified as in a paper plant described. In this job, the controls are set to operate with a precision that insures waste-free heating, cooling and ventilating operations. Information available. .....**Item 203**



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International Metal Products Co., Phoenix, Ariz.

# Evaporative Cooling for Farm Animals

**Farm animals that are kept in proper temperature environment during hot weather will eat more and therefore will produce more. An effective means for reducing air temperatures in barns and improving animal comfort is installation of evaporative coolers and this is discussed.**

IN all normal warm blooded animals, the body temperature endeavors to remain constant within relatively narrow limits. The temperature for most farm animals is listed in Table I and the figures give some indications why cooling is necessary in buildings housing livestock.

This ability to maintain a constant temperature despite widely changing external conditions is attained by maintaining an equilibrium between the heat produced by the animal and the heat which it emits. Animals may be considered as machines which produce heat in proportion to their metabolic processes and activity. Cattle generate approximately 3000 Btu per hour. In temperate climates the farm animal has no difficulty in ridding itself of the heat it produces from its food and as a result of its activity and productivity. Only a very small solar load is imposed on the animal and the ambient air temperature is always below that of the animal's temperature so that the normal physical methods of dissipating heat are adequate.

TABLE I—BODY TEMPERATURES OF FARM ANIMALS

| Animal | Temp. Deg F | Animal | Temp. Deg F |
|---|---|---|---|
| Beef cow | 101.0 | Pig | 102.5 |
| Dairy cow | 101.5 | Rabbit | 103.1 |
| Sheep | 102.3 | Goat | 103.8 |

In hot weather, however, an entirely different situation exists. Farm animals control their body temperatures by a somewhat different method from that used by man. Man is a sweating animal. Not so farm animals. With the exception of the horse, they do not possess functional sweat glands. Their body temperatures are likely to rise when the weather gets hot, and being non-sweating creatures, they must get rid of excess heat by rise of body temperature and thus increase their rate of radiation. They do have some measure of control however. They eat less. They produce less. A heavy producing Holstein cow will give about as much milk at zero degrees as she will at 70 deg. When the air temperature reaches 90 deg, milk production has decreased materially. With hens (chickens have a body temperature of 107.1 deg), when the air temperature is higher than 90 deg, the hen is no longer able to lose heat from her body feathers as well as by respiration fast enough to prevent a rise in body temperature, and egg production decreases. Swine do not sweat at all; consequently, they are extremely sensitive to high temperatures. High temperatures result in slower weight gains and heat prostration is to be expected at temperatures above 90 deg.

## Ways to Cool Animals

Although it is difficult to draw definite conclusions from present data, the results of various workers show that at air temperatures above 85 to 90 deg the rectal temperatures, heart rates and respiration rates of farm animals rise with increasing air temperature. These observations confirm the existence of some form of pyrexial threshold at an environmental temperature of about 85 deg. Or to put it another way, the upper limit of thermal neutrality for farm animals is at the critical air temperature of 85 deg. Many attempts have been made to

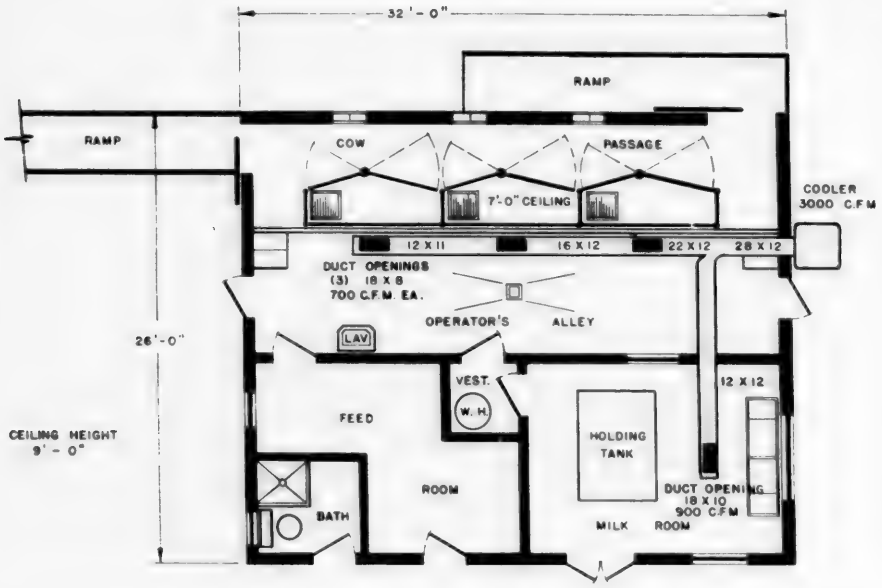



Fig. 1. Air cooling installation for a typical milking parlor.

compensate for the higher summer temperatures. Shade helps. So does cooler drinking water. Sprinkling farm animals and fogging poultry also are of some benefit. Water-cooled barn and water-cooled farrowing house roofs have been tried. Clipping long-haired animals may reduce body temperature by as much as two degrees. Ventilation will lower temperatures, but when outside air gets about as hot as the animal, air circulation does little good, because there is nothing to carry away the excess animal heat.

The use of trees is recommended because the temperature may be as much as five degrees cooler under a tree than under an artificial shade. Trees evaporate water through transpiration and it is the evaporation of water that reduces the temperature. A pound of water evaporated has the same cooling effect as the melting of seven pounds of ice. This rediscovery of a very old fact has resulted in the evaporative cooler which can be used to good advantage in cooling farm animals for economic reasons.

An evaporative cooler consists of a sheet metal cabinet with louvered sides containing saturation media. Within the cabinet is a fan for drawing the air through these saturation pads. Water circulated to the pads is evaporated and the incoming air is thus cooled. Although temperature and relative humidity are involved in the evaporative process, a well designed cooler will reduce the outside air temperature to 80 deg or lower regardless of climatic conditions. Coolers are inexpensive in cost and economical in operation with little service and maintenance. They are ideally suited to farm animal shelters in that they use outside air and, therefore, do

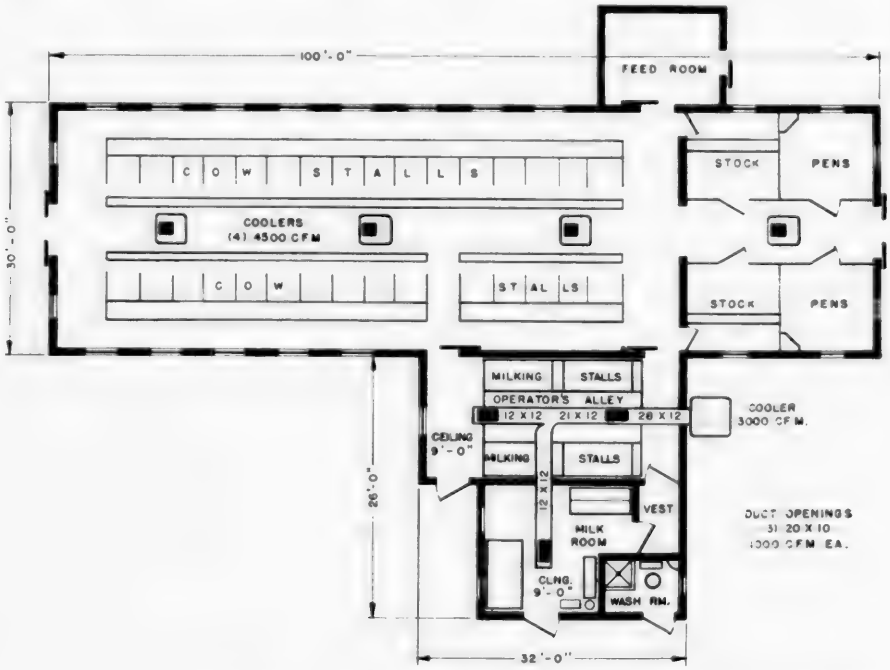
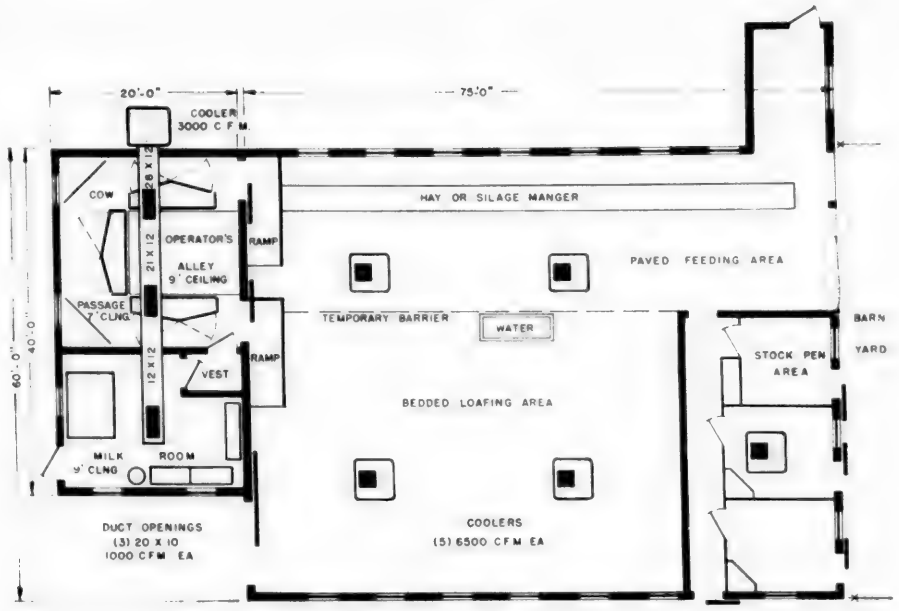



Fig. 2. Air cooling installation for a conventional stall barn.

Fig. 3. Air cooling installation for a loose housing barn.




not require tight construction for the spent air is exhausted. The fresh air also removes odors and reduces harmful effects of ammonia fumes from urine and excrement. At night in the spring and fall, they may be operated for ventilation.

Evaporative coolers are rated by the number of cubic feet of air delivered each minute, and they are usually sized by the air change method. Suppose a building of 10,000 cubic feet capacity is to be cooled and a two-minute air change is desired. Thus 10,000 cubic feet of air must be moved through the cooler every two minutes or a cooler with a 5000 cfm delivery is required. For cooling farm animals, the cooler should be sized to change the air within the shelter in one and one-half to two minutes, assuming the ceiling height does not exceed 10 ft. This is conservative and will keep the shelter at 85 deg or lower. A consideration that must not be overlooked in installing the evaporative cooling system is the need for exhausting the same amount of air as is supplied. If the air is not removed as fast as it is introduced, air pressure will increase to a point where there will be an almost complete stoppage of air flow. There will be a noticeable increase in temperature and humidity. Exhaust openings should total at least three times the size of the discharge opening of the cooler. This essential is, as previously mentioned, a distinct advantage evaporative cooling enjoys, as farm animal shelters are of open construction—in many cases being little more than a shed roof or, as is common of poultry houses, slotted walls.

## Specific Applications

Figure 1 presents the floor plan of a high production dairy unit or milking parlor for a herd of fifty cows. The cooler has been sized to deliver 3000 cfm, which will replace the air in the milking parlor every 1½ minutes. The cool parlor provides comfortable working conditions for the operator and makes for easier handling of the cows which can be difficult to manage in a hot barn. The cooling system also effectively eliminates odors and minimizes the fly nuisance as flies avoid places where there is good air movement. The duct work for this system was sized by the equal friction method for a pressure drop of 0.10 inches static pressure per 100 ft of run. If the installer is inexperienced in sizing ducts, a rule of thumb that may be safely used is to make the area of the sum of the outlets or duct openings at least equal to one and one-half times the size of the cooler outlet. Cost of cooler and duct work for this system was approximately $200 while operating expense averaged $4 per month.

Figure 2 illustrates a conventional stall barn. Here the cooling system has been sized for a 1½-minute air change in the milking parlor section of the barn and a 1½ to 2-minute air change in the stall and stockpen area depending upon the ceiling height. The coolers for the main part of the barn are mounted on the roof with vertical ducts dropped down to the ceiling. In the case of high ceiling barns, the ducts should terminate approximately 10 feet above the floor as there is no advantage in cooling the upper air space of the barn. The cost of the coolers and duct work for this system is approximately $1000. Figure 3 shows a cooling system for loose housing barns which are common in areas where winter weather requires the herd to be stabled. Loose housing is well suited through the addition of an evaporative cooling system for summer use. Instead of turning the cows out to pasture during the hot summer months, the animals can remain in the cool barn which will promote milk production at high level. The system illustrated in Figure 3 is designed for a 1½-minute air change in the milking parlor and a 1½ to 2-minute air change in the feeding, loafing and stockpen areas. Cooler and duct work cost for this system just described approximates $1300.

Evaporative cooling may also be applied to the other types of farm animal buildings and to poultry houses. It gives the farmer an effective yet inexpensive means of cooling livestock and poultry that will increase weight gains per unit of feed consumption and productivity and, of course, prevent heat prostration.

# U. S. Army Develops Heating and Air Conditioning Units

H. GRAUS
Engineer, Research and Development Laboratories, Fort Belvoir, Va.

**As a result of studies conducted by the Army, special units have been developed for heating and air conditioning prefabricated buildings for use in various temperature zones, and for vans carrying special equipment.**

ONE of the responsibilities of the Corps of Engineers' Research and Development Laboratories, Fort Belvoir, Virginia, is to make the shells of prefabricated buildings and vans fit for occupancy by men or machines or both, regardless of existing temperatures.

Through the development of new heating and air conditioning equipment, the Laboratories are endeavoring to make these shelters livable personnel-wise and, where required, to provide proper operating conditions for temperature sensitive, special purpose equipment under Arctic and tropic, as well as temperate conditions.

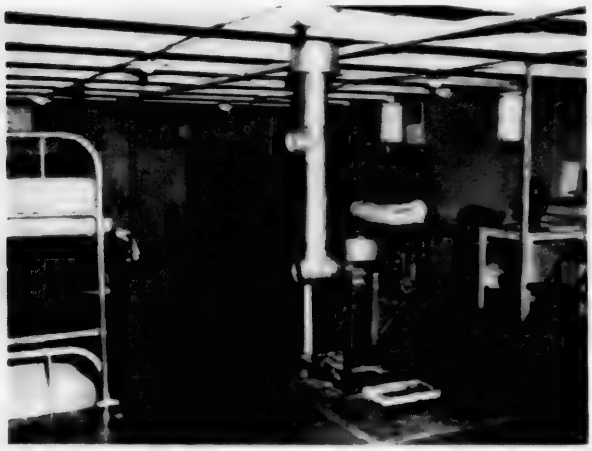


Fig. 1. A 50,000 Btu per hr heater installed in a 20 by 48 ft prefabricated building, undergoing test in Canada.

During World War II, and as late as 1950, primary dependence for field units of this type was placed on commercial models or specially built units designed by manufacturers to suit a particular requirement. Heaters thus supplied were found to be incapable of starting and operating at minus 65 deg F and unable to burn Class 2 diesel fuel, the available fuel in the field. Frequently fire hazards developed.

### Existing Units Not Suitable

Criticism directed against the air conditioning units stressed their excessive weight and size, their inability to perform at high ambient temperatures of 125 deg and their complicated method of assembly. Accessories unsuited for high temperature operation and the unavailability of spare parts were listed as other unsatisfactory features.

It was chiefly to correct these deficiencies and to establish standard units to suit all applications that the present project was initiated at ERDL.

After a study determined that commercially available equipment would not meet military characteristics, a survey was made of various Army using agencies as to their respective requirements.

This survey indicated that in the heating field, a 50,000 Btu per hr and a 70,000 Btu per hr barracks type heater would take care of most 20 x 48 feet buildings in the temperate and arctic areas. For vans, a 60,000 Btu per hr heater seemed adequately to suit the majority of applications. It was further determined that the ordinary household type heater, lacking radiant capacity and unable to burn Grade No. 2 diesel fuel oil, was impractical for barracks use.

### New Heater Developed

On the basis of these findings a heater utilizing essentially a vaporizing pot type burner was developed. It is shown under test in Fig. 1 in an Arctic shelter at Fort Churchill. The shell is cylindrical and perforated so that this heater is 35% radiant as well as convective. For shipment, the stack and jack can be packed around the shell to give minimum cubage as in Fig. 2. A grille at the top is furnished for minor cooking.

A fan was mounted under the sleeve to provide a more equal distribution of heat, after Churchill tests showed a difference of 60 deg in temperatures at the floor and ceiling in the corners. By blowing across the heater (90

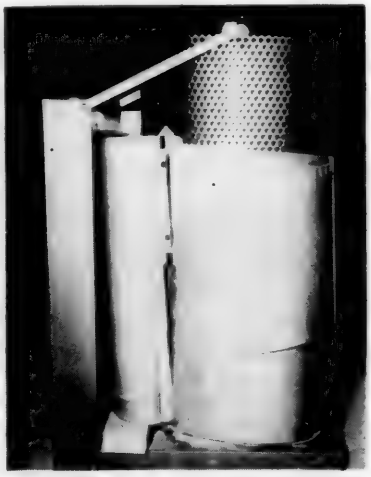


Fig. 2. Heater shown in Fig. 1, ready for packing before shipment.

degree position) or by blowing straight down on it (180 degree position), the fan cut this difference to 10 deg with accompanying savings in fuel.

Both the 50,000 Btu and the 70,000 Btu units are standard and will soon be military designs. Present work is being conducted on the development of a multi-fuel burner to accommodate gasoline as well as oil, due to a possibility that gasoline may be the only fuel in the field. A tamper-proof barometric damper for regulating stack draft has been developed, and work is underway on a tamper-proof float control.

### Van Heating

In van heating, emphasis has been placed on gasoline burning equipment since most prime movers and trucks pulling trailers or carrying van bodies are equipped with gasoline engines.

Electrically controlled automatic safety devices are incorporated in the 60,000 Btu per hr heater, Fig. 3, developed for use in vans carrying expensive equipment. A comparatively small unit, it is capable of heating an average three bedroom house. Now standard, the unit has been used on topographic vans, portable television stations, mobile photographic processing laboratories, mobile soil testing laboratories and many other Air Force, Marine, Ordnance and Signal Corps special purpose vans. It can be used with a plenum or mounted in a duct.

Another 60,000 Btu per hr van heater under test at the Laboratories is interchangeable with the above except for its 24 volt DC electric circuit. A heater is under development for use with guided missile, radar and fire control trailers and burns either gasoline or diesel fuel. Also rated at 60,000 Btu per hr, it utilizes 400-cycle power for the operation of its controls and blower.

A 90,000 Btu per hr version of this last mentioned unit was developed primarily for use with a 40 x 40 ft special purpose building. It too can burn gasoline or diesel oil, and is equipped with similar controls. As shown in Fig. 4, the heater is ready for mounting outside the building. The air is ducted in and out of the building through 12-inch diameter collapsible ducts insulated and lined with fiberglass and mounted on a plenum chamber. The chamber is eliminated for inside use. This heater is about to be standardized.

Fig. 4. A 90,000 Btu per hr heater ready for mounting on the outside of a prefabricated building.

### Air Conditioning

On the cooling side of comfort control, a family of air conditioners ranging from 9,000 Btu per hr for small shelters to 75,000 Btu per hr has been developed.

The smallest is similar to a commercial window unit except that it is smaller and lighter and capable of operating continuously at 125 deg. It has been used in the mobile soil testing laboratory and in a Signal Corps mobile communications shelter. Effects are being made to lower its power requirements. Standardization is expected in the near future.

The next size in the family, the 18,000 Btu per hr air conditioner, is the so-called "building block" unit. Now standard, it features five sections, each rotatable in any one of 90 deg positions to permit a maximum number of different configurations. Its mountings may be all inside, all outside or split type. Present development includes an identical unit for 400-cycle power for guided

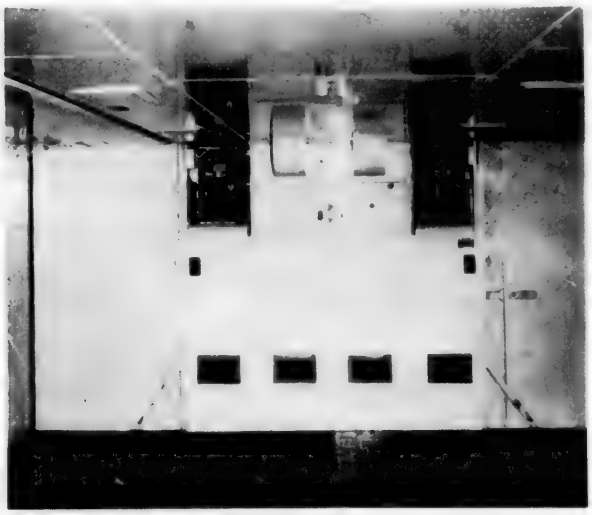


Fig. 3. Two 60,000 Btu per hr heaters mounted in engineers' expansible topographic van.

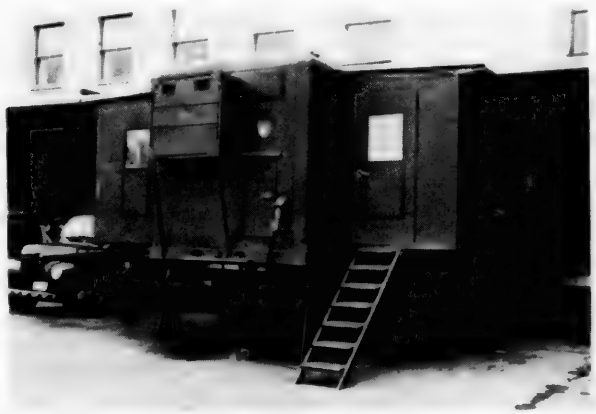


Fig. 5. Split mounting of 18,000 Btu per hr air conditioner on an expansible van.

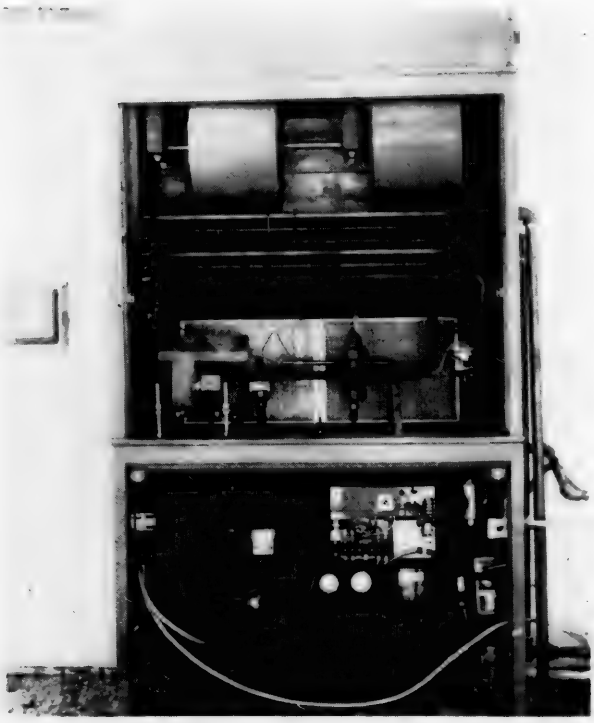


Fig. 6. Interior view of 60 000 Btu per hr water cooled air conditioner.

missiles system, radar and fire control trailers. See Fig. 5.

Originally developed for spot cooling of planes, the next unit, 26.500 Btu per hr is trailer mounted and gasoline engine driven. It is now used on weapons systems in which the air is ducted in and out of the control trailers by 12-inch collapsible insulated flexible ducts. Incorporating humidity as well as temperature control, the standard unit can be used in any application when power is not available.

It may be replaced by either a 48.000 Btu per hr unit now under test or a 60.000 Btu per hr unit to be tested shortly. Also trailer mounted but 400 cycle motor driven, this type air conditioner is equipped with ducts for air supply and return, and employs automatic temperature and humidity control.

### Water Cooled Air Conditioner

The only water cooled air conditioner in the Army supply system is shown in Fig. 6. It is a 60.000 Btu per hr size, and was designed primarily for hospital use in relatively permanent establishments where water supply is plentiful. It is electric motor driven and is furnished with a cooling tower so that the water can be recycled with only a small amount of makeup necessary to take care of loss from evaporation.

In the air conditioning field an exhaustive study is being conducted on coils. Twelve units utilizing six different combinations of aluminum coils are undergoing extended tests at the Laboratories' Panama Test Station. Two thousand-hour salt spray tests have been completed on five coils of different materials but of identical size and shape.

Mention should be made of future development possibilities in the heating and air conditioning field. These include a gas turbine heater, an atomic powered combination heater and air conditioner, air cycle air conditioning, and a small centrifugal compressor. All point toward smaller and lighter items.

## Btu Rating Adopted for Room Air Conditioners

The American public was assured recently that an understandable method of comparing cooling capacity ratings of room air conditioners would be a part of the 1957 sales promotion by most manufacturers of such equipment.

The Room Air Conditioner Section of the Air-Conditioning and Refrigeration Institute adopted a proposal that cooling capacities of room air conditioning units be published on the basis of ratings and tests performed under ARI Standard 110-56, which provides for expression of capacity in terms of British thermal units.

Adoption of the standard test and rating procedure, measured in Btu per hour, was made in an effort to dispel public confusion resulting from attempts to describe units in terms of horsepower, tons and other measurements, none of which, it was agreed by signatory manufacturing companies, provides a firm basis of comparison as to the cooling capacity of respective units.

While British thermal units are as generally unknown as the octane ratings applied to various grades of gasoline, publication of the cooling capacity of room air conditioning units in these terms, under a common standard, will give prospective purchasers an opportunity to compare units of various manufacturers.

Agreeing that cooling capacity is not the only sales feature, or basis of comparison, the ARI Section, whose membership includes the manufacturers of more than 90% of the nation's output of room air conditioners, felt that testing and Btu rating their products according to the ARI standard would provide a bench mark for other comparisons. While the Btu ratings have been used by some manufacturers in the past, failure to use a standard method of testing and rating has resulted in confusing the public. It is felt that with the establishment of the standard method of testing, such confusion will be eliminated.

Manufacturing members of the ARI Room Air Conditioner Section who have said they will make public the Btu per hour cooling capacity ratings of their products, are:

Admiral Corp.; Airtemp Division, Chrysler Corp.; Birtman Electric Company; Carrier Corp.; Emerson Electric Manufacturing Company; Fedders-Quigan Corp.; Friedrich Refrigerators, Inc.; Frigidaire Division, General Motors Corp.; General Electric Company; Gibson Refrigerator Company; Hotpoint Company; Hunter Fan & Ventilating Company, Inc.; Lonergan Manufacturing Division, McGraw Electric Company; Kelvinator Division, American Motors Corp.; Lewyt Air Conditioner Corp.; Philco Corp.; Quiet-Heet Manufacturing Corp.; Sears Roebuck and Company; O. A. Sutton Corp.; Westinghouse Electric Corp.; Whirlpool-Seeger Corp.; York Corporation.

In addition to these manufacturers, other makers of room air-conditioners are expected to join in this industry effort to make available to the buying public a standard basis for comparing ratings.

LOUIS BLENDERMANN ON

# PIPING AND PLUMBING

## Water Service for Research Laboratories

RESEARCH laboratories are a special type of building and are designed primarily to house the various kinds of equipment and apparatus used by scientists, engineers and chemists in their work. Research laboratories may differ in size and shape to suit the needs of the particular experiments to be performed, and the specific type of occupancy equipment used, will determine the design of the building itself. In general, a research laboratory is that form of structure which is built around the exacting demands of the men and their equipment.

Regardless of the type, shape or function of the research laboratory, an abundant supply of cold and hot water is always required. It is important to consider a number of factors in the design of an adequate water supply system for the structure.

### Distribution of Water Piping

Water for the laboratory is generally supplied from either an existing street service or from an elevated or underground storage tank, erected on the site. After the water enters the building it is furnished to the various fixtures and equipment by means of a distribution system. A typical arrangement of the piping for a research laboratory is shown in Fig. 1.

For the purpose of example, Fig. 1 shows a rectangular shaped building, devoted to chemistry research. Within the building, the water supply is divided into two separate systems. One system is known as the potable cold water, while the other is called process cold water.

The potable cold water serves the drinking fountains, kitchen, plumbing fixtures, emergency showers, eye wash fountains, air conditioning and heating equipment as well as the other domestic needs of the building. The process cold water is supplied to all laboratories, including outlets and equipment related to experimental purposes.

Since the scope of this article is confined only to the process cold and hot water system, the potable water system will not be emphasized even though it is mentioned. The process cold and hot water system of piping might be arranged in the corridor of the basement, Fig. 1, and branches taken from the cold and hot water mains shown are run up through the service shaft where take-offs are made for the laboratories and equipment.

### Separation of Water Supply

It is very important that a separate system be furnished for the process cold and hot water for this prevents the danger of backflow into the potable water system in the event of a pressure drop in the outside water supply system. In some instances, backflow can suck liquids used in experiments, into the process water piping and thus into the potable water system unless

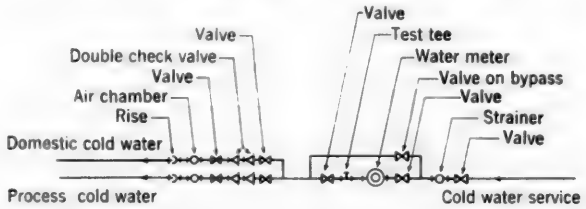



Fig. 2. Arrangement of water supply lines to provide separation of services

adequate protection is afforded. Where potable water is concerned, every precaution must be taken to avoid its contamination.

In order to provide a potable and process water system, it becomes necessary to separate the water supply at a convenient point in the building. There are several different methods that can be employed to separate the water supply and the method shown in Fig. 2 illustrates one means.

As indicated in Fig. 2, separation in the building is accomplished at a point near the water supply entry. Assuming that water metering is required, the water supply passes through a control valve, strainer, valve, water meter, test tee and another valve. The water

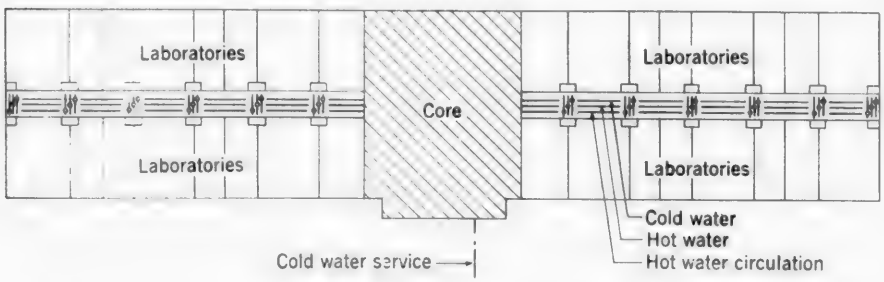



Fig. 1. Laboratory building showing typical distribution of process, cold and hot water services.

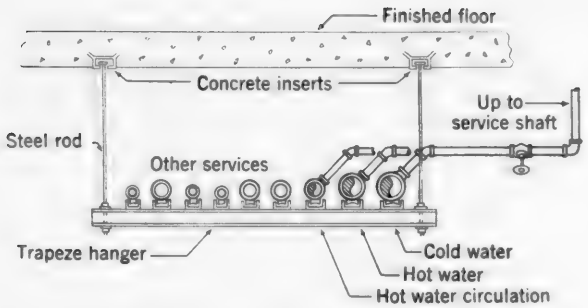



Fig. 3. Arrangement of process, cold and hot water circulation on distribution rack in corridor.

meter is so arranged that it can be easily removed and another meter quickly installed in its place. The valved bypass permits uninterrupted water service while the replacement is being made. If pressure reducing valves are required to handle an excessive water pressure, they can be placed either near the water meter or on both the process and potable water supply branches. In any event, the water meter and control must be installed to conform with the requirements of the local water department or plumbing authorities, whichever holds jurisdiction in this matter.

Next, the supply is separated as shown. At this point, both the potable and process water services are each equipped with: A valve, double check valves and another valve. The purpose of the double check valves is to ensure against any possibility of backflow in the event of a pressure drop in the water service or main.

Adequate protection is afforded in the laboratory in the form of vacuum breakers to prevent back siphonage of water through laboratory faucets or outlets. However, the physical separation including double check valves is an added safety factor. When complete and positive separation is desired because of the dangerous nature of the experiments being performed, then it becomes necessary to isolate the process cold water by means of a water tank located on the roof of the building.

### Hot Water Systems

When both potable and process cold water systems are provided in a research laboratory building, then the potable and process hot water systems should also be separate. Thus an individual means of generating hot water should be included for both systems. A hot water circulating line in each case will assure hot water at the turn of the tap. The type of hot water generating equipment selected should be of the size and capacity best suited for the demand requirements.

### Support of Distribution Piping

The process cold and hot water distribution piping may be located in the basement of the building, in the top floor or attic space of the building or in other areas as selected by the engineer and the architect. In any event, it is imperative that the piping be adequately supported to avoid strain to the piping and to prevent its vibration. Figure 3 represents a suggested method of support.

Referring to Fig. 3, it will be noted that a trapeze hanger is employed which consists of two channels fastened together and secured in place with steel rods, hung from concrete inserts. The piping in turn rests on roller supports that are bolted to the trapeze. The rollers permit some movement of the piping, especially in the case of the hot water lines.

Since expansion is a factor that must be considered with hot water lines, proper expansion devices must be utilized. The expansion devices are usually loop offsets provided in the piping or are patented items made by several manufacturers. When these devices are used, the trapeze hanger that follows the expansion device is generally anchored. This is accomplished by angular bracing of the trapeze hanger at either side, to concrete inserts set in the underside of the concrete slab. The hot water lines are then anchored or clamped to this particular trapeze to limit the extent of expansion or to confine the expansion between anchored trapezes. Continuous strip concrete inserts are used in many cases to offer a greater flexibility in locating the steel rods at the most convenient spot for the piping.

Trapeze hangers are placed at prescribed distances apart, dependent upon the piping material used. Since copper tubing is used rather extensively, the trapeze hangers are set rather close together. When carefully installed and the piping properly arranged, the trapeze hanger can be counted on for many years of trouble-free service.

### Insulation

To prevent sweating or condensation of the cold water lines, the piping is covered with suitable anti-sweat covering. To retain the hot water temperature suitable covering or insulation is applied to the piping. There are several devices manufactured, to set into the underside of the insulation at the point where it rests on the roller supports and thus prevent damage or flattening of the insulation at this point.

### Service Shafts

The service shaft is a cut in the concrete that allows

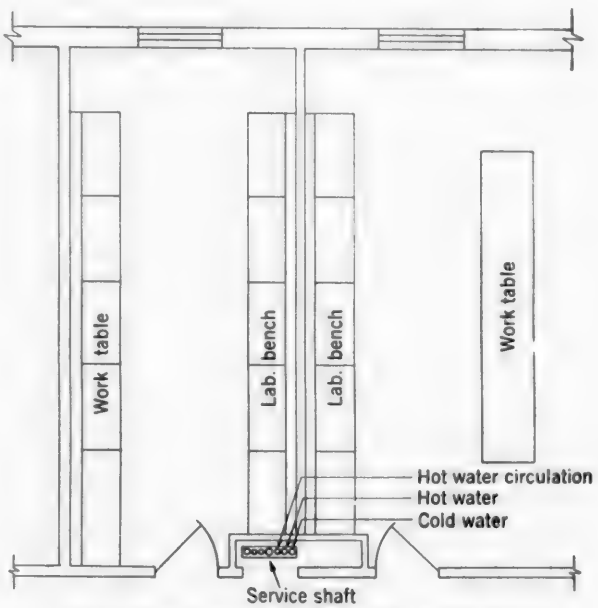



Fig. 4. Typical arrangement of piping in service shaft.

for the passage of the piping risers. Figure 4 suggests a typical arrangement of a laboratory room and its component service shaft.

Branches are taken from the hot, cold and circulation mains in the corridor and are installed as vertical risers to supply one, two or more floors of laboratories. Control valves are placed at each floor to shut off the branches to the laboratory equipment or outlets contained in the laboratory bench. Often, valves are placed at the base of the risers in the corridor to control the riser. The slot in the service shaft should be large enough to permit each service contained to be adequately supported.

The service shaft is a rather large space which often contains in addition to the laboratory piping, exhaust ducts, electric controls, cylinder gas bottles and other equipment needed for the laboratory benches.

Service shafts are designed in different sizes and shapes to suit the particular design needs of the building. Moreover, the service shaft may be located as shown in Fig. 4, or can be placed in other positions to suit special needs.

### Laboratory Benches

Laboratory benches usually contain a sink and a number of table top outlets for the different services. Figure 5 is a typical example of how the various services are installed under the benches.

In this instance, a bench is included on either side of the wall. Although, there are a number of ways in which the piping can be supported, Figure 5 shows a method that is frequently used. Since only the process cold and hot water is featured in this article, the accent

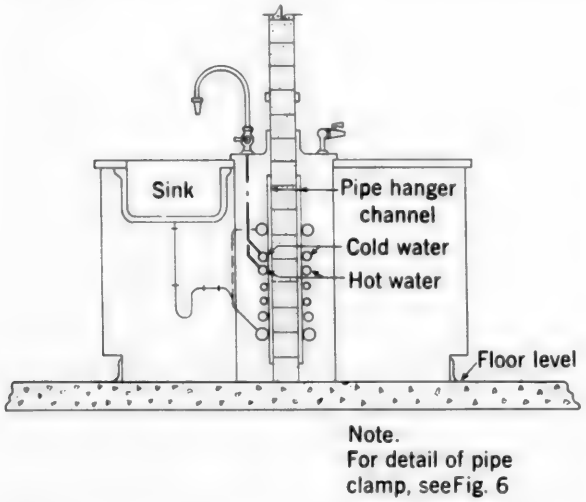



Fig. 5. Arrangement of process, cold and hot water for laboratory bench.

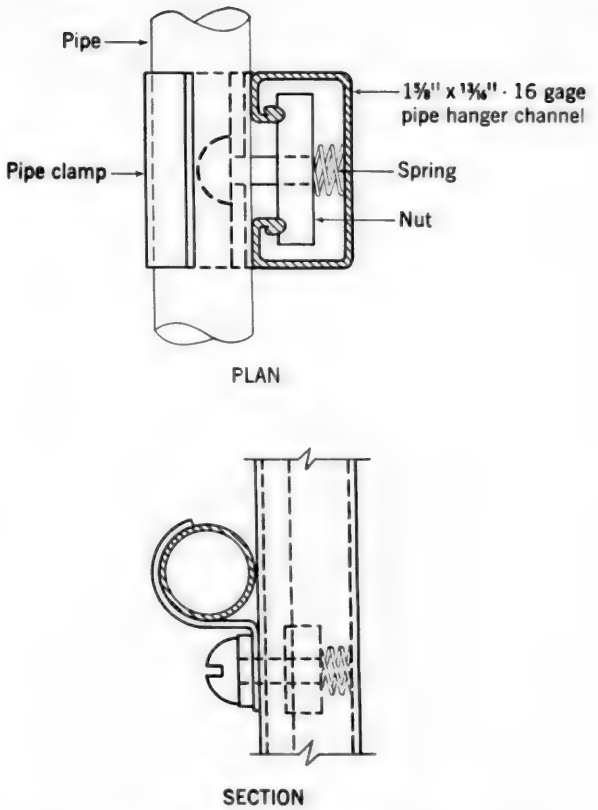



Fig. 6. Pipe clamp arrangement for support of process, cold and hot water services under laboratory bench.

is placed on the support of these lines and it will be noted that the water lines are supported in a certain prescribed way as detailed. Figure 6 shows how the piping is supported.

Pipe hanger channel strips are placed vertically every few feet and pipe clamps are attached. These clamps assure an adequate support for the piping and yet offer a very flexible arrangement for a group of services.

When a process cold and hot water system is carefully designed and installed, it will give many years of trouble-free performance and if the piping is properly supported, undue strain on the piping itself caused by pipe movement will be avoided. Expansion devices compensate for the expansion of the hot water piping. Should dissimilar metals be joined together in the piping system, electrolysis can be prevented by means of patented isolator fittings or couplings. Properly sized and placed water hammer eliminators will prevent the clatter and noise normally associated with water hammer. Equally important, vacuum breakers installed in suitable locations are assurance against back siphonage.

## ASHAE Adds Illinois-Iowa Chapter

A charter meeting of the Illinois-Iowa Chapter of the American Society of Heating and Air-conditioning Engineers was held in the Le Claire Hotel, Moline, Ill., on September 19. It marks the 64th chapter of the society.

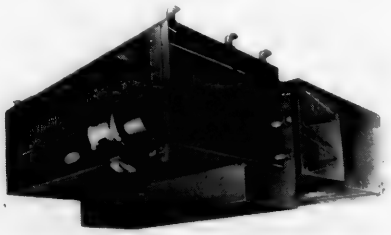
The new officers of the chapter are president, Robert L. Graham, Rock Island, Ill.; treasurer, Everett O. Hull, Peoria, Ill.; secretary, Donald H. Ninow, Moline, Ill. Present at the initial meeting of this chapter were John W. James, Chicago, president of the society, who spoke on The Future of Air Conditioning and the Society.

# NEWS OF EQUIPMENT AND MATERIALS

**Use the convenient prepaid postcard appearing on page 105 for securing additional information on new equipment and materials described in this department.**

## Heating and Ventilating Line

An improved and expanded line of heating and ventilating products designed for large area buildings, schools, auditoriums, and gymnasiums is announced by Carrier Corp., Syracuse, N. Y.



The line will offer seventy-two capacities and coil arrangements in six different model sizes. Output of the full line ranges from 47,000 to nearly 2,000,000 Btu per hr and from 1500 to 32,000 cfm.

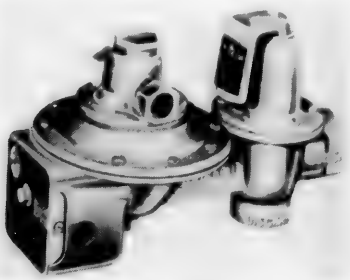
Six coil capacities in each of the six units are available in either distributing or U-bend tube versions.

The units are designed to permit a choice of installations including either wall or ceiling suspension (illustrated) or floor mounting. They can be used with steam or hot water and work equally well with or without ducts. Air temperature from the units can be controlled in two ways: by modulating steam through the distributing tube coils or by the use of face and bypass dampers.

**More information? Circle Item 1 on postcard, page 105.**

## Water Boiler Valve

A valve that provides protection for hot water boilers from one single unit is announced by Bell & Gossett Co., Morton Grove, Ill.



Called the No. 190 System Saver, the unit combines an ASME pressure relief valve rated at 190,000 Btu per hr, an automatic pressure reducing valve, a safety high limit cutoff switch, and an emergency feed device, into one unit.

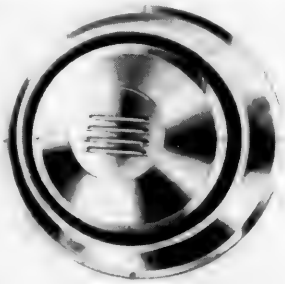
If electrical controls fail to shut off a burner and continued firing causes a steaming condition in the boiler, the emergency feed device is energized, permitting fresh water to enter the system, until firing can be stopped manually. City water pressure should be in excess of the system water pressure, at least 35 psi.

Literature describing the valve's operation in detail is available.

**More information? Circle Item 2 on postcard, page 105.**

## Wall Exhauster

A new redesigned Model W side wall exhauster with all-aluminum housing is made by Carnes Corp., Verona,

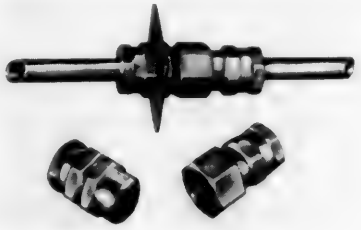


Wis. This new design features a more compact unit with a lessened overall projection and a much higher degree of ventilation through the motor compartment. The motor is mounted out of the air stream, and the backwardly inclined centrifugal wheel is available in four sizes with a capacity range from 150 to 1850 cfm.

**More information? Circle Item 3 on postcard, page 105.**

## Freon Coupling

Development of a new self-sealing coupling for applications of Freon-12 and 22 has been announced by Aeroquip Corp., Jackson, Mich. The new coupling, Series 5400, is designed for all types of Freon applications, and



is particularly suited where there is need for precharging air conditioning units with Freon at the factory. By using this coupling, manufacturers may fill and charge units with Freon for shipment to distributors with no loss of Freon during transit or extended periods of storage in distributors' warehouses. At the time of installation, no further bleeding or charging of Freon lines is necessary.

A jam nut locks one section of the coupling to a bulkhead. The adapters of the coupling are recessed for brazing to copper tubing. The coupling is available in ¼ through 1½ in. O.D. tube sizes.

**More information? Circle Item 4 on postcard, page 105.**

## Centrifugal Ventilators

Two centrifugal ventilators are announced by The Burt Mfg. Co., Akron, Ohio.

Designed for operation at slow speeds, the units are suitable for use in schools, hospitals, dormitories, institutions, arenas and in commercial and industrial applications where low noise levels are desirable.

Named "Centriflow," the fan ventilators are available with a V-belt drive (illustrated) for capacities from 675 to 36,430 cfm and in a low profile model of spun aluminum for installations requiring lower capacities from 408 to 2508 cfm. All models carry the PFMA certified capacity label, guaranteeing their ratings.

Both units have non-overloading, backward curved blade fan wheels with motors in separate, air-cooled compartments insulated for quietness by rubber vibration pads.

Thirteen basic sizes are made in the V-belt model, and three basic damper types and motors in all power characteristics from 1/6 to 7½ hp. The direct drive model, in two basic sizes, offers a choice of four damper types and motors ranging from 1/12 to ½ hp. A package unit, the direct drive model is shipped, ready to install on the roof curb.

Complete data on the line is included in Bulletin S.P.V.-12A available on request.

More information? Circle Item 5 on postcard, page 105.

## Commercial Air Conditioners

Two lines of air conditioners for stores and office buildings are announced by Crane Co., Chicago, Ill.

The new units come in an SU series which include 3, 5, and 7½-ton air conditioners, and an MU series in 10- and 15-ton sizes for heavier duty.

The smaller SU series, painted a two-tone gray, comes completely assembled, wired, and ready for water supply, electrical supply, and drain connections. They are single-refrigerant systems, with one hermetic compressor, a water-cooled condenser, and a cooling coil. They are charged with Freon at the factory.

An air discharge grille can be attached so that air is discharged either from the front or top of the unit. Ducts can also be attached by removing the grille. Concealed openings in the cabinet are provided for return air ducts, eliminating the need for an intake grille.

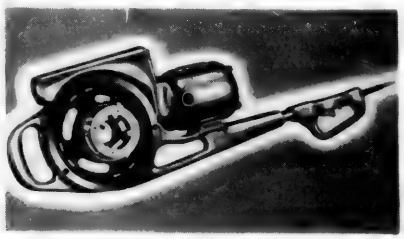
The larger MU series air conditioners are shipped in two assembled packages; one containing the refrigerant section, the other containing the blower section. The blower section can be mounted either at the top or side of the refrigerant section.

The MU series has twin refrigerant systems, giving the advantages of two-stage cooling. On hot days, when the heat load is high, both systems can be operated for peak cooling performance. On milder days, one system can be operated for humidity control, without over-cooling.

More information? Circle Item 6 on postcard, page 105.

## Portable Power Drive

The Toledo No. 68, a portable power drive made by The Toledo Pipe Threading Machine Co., Toledo, Ohio, is used for pulling, lifting, threading and turning on a wide variety of jobs.



The new streamlined frame is slightly heavier and more sturdy than previous models. New ball bearing design improves service life and minimizes periodic maintenance. The unit is easier to hold and safer to operate because of a new handle design and relocation of the control switch to a convenient position on the handle. The trailing wire is located out of the way of the operator and offered in either painted finish or highly polished aluminum finish. Adaptors for most standard die stocks, as well as square socket adaptors, add to its versatility. The No. 68, powered by a 115-volt reversible a-c or d-c motor, or 90 psi air motor, weighs only 33 lb.

More information? Circle Item 7 on postcard, page 105.

## Return Air Grilles

Horizontal and vertical grilles for return air, combustion air, ventilating, and cooling systems, are being manufactured by The Lima Register Co., Lima, Ohio.

The company's line includes the Series 15H horizontal (illustrated) grilles available in 57 sizes, and the Series 15V vertical grilles in 56 sizes.

The grilles have a permanent metallic finish to harmonize with room interiors. They are made from one solid piece of heavy gage steel with the horizontal fins and vertical mullions an integral part of the face. There are no welds, mitered joints, jagged edges or loose construction.

A 30-degree deflection of the horizontal fins eliminates a view through the grilles, and they may be reversed for locations above or below the line of vision.

More information? Circle Item 8 on postcard, page 105.

## Prefabricated Chimneys

Insulated prefabricated chimneys for use with furnaces, boilers, and incinerators has been announced by Winnen Incinerator Co., Bedford, Ohio. These cost considerably less than brick or steel chimneys and are faster and easier to install. They may be "free standing" or supported by the building.

Available in 18 or 10 in. I.D., special sizes are supplied on order. A cast refractory lining 2 in. thick withstands continuous flue temperatures in excess of 1800 deg F. On special order, Winnen supplies chimneys that withstand flue temperatures in excess of 2200 deg. Jacket is aluminum to obviate painting and maintenance.

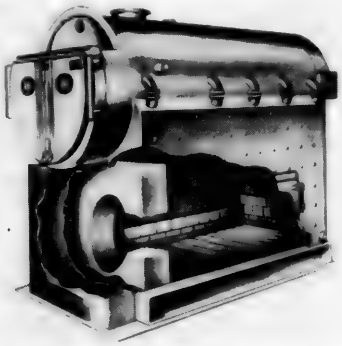
When installing, the two-foot sections are cemented together with high temperature cement and then banded with aluminum bands. Supports or braces are recommended for every five feet of chimney. Breeching is also supplied.

More information? Circle Item 9 on postcard, page 105.

## Oil-Fired Steel Boilers

A line of 18 steel boilers for oil firing, termed LoSet, has been announced by Pacific Steel Boiler Division, National-U.S. Radiator Corp., Johnstown, Pa.

These new boilers are for commercial, institutional and industrial installations requiring a SBI low pressure steam rating of from 4,250 to 60,710 sq ft. The SBI



water rating extends from 6,800 to 97,140 sq ft. The zone of combustion has been moved up into the firebox. Sufficient refractory combustion chamber can be installed so that well known makes of oil burners can operate on any grade of oil, producing good combustion, without flame impingement, and at a low noise level.

The firebox in the new boilers is completely separated from the shell. The boiler therefore is not weakened structurally by the front cutout that receives the oil burner.

The water line in the four smallest size boilers, which are produced with oval shells, is 72 in. from the floor. In the 14 larger sizes, which have round shells, the water line varies from 71½ to 153½ in. above the floor. The maker claims this low water line eliminates problems involving digging boiler pits, altering buildings to provide headroom, and constructing masonry boiler bases.

Both tank and instantaneous types of domestic water heaters are available for use with these new boilers.

More information? Circle Item 10 on postcard, page 105.

## Heating and Cooling Units

Cabinet type air conditioners are offered in a new line by Warren Webster & Co., Camden, N. J., for modernization of hotels, office buildings, apartments, motels, and similar structures.

Called Newport, the units may be installed room-by-room or floor-by-floor. The heating coil in the cabinet is connected to the existing steam or forced hot water heating system. A self-contained, air-cooled, hermetic refrigeration cycle provides cooling and dehumidification.

Housed in a gray-green furniture steel cabinet, the unit is installed in a sleeve which extends through the wall. Windows are not blocked or obstructed in any way. It needs no ductwork, cooling tower, or drain.

In ¾- and 1- hp sizes, the units are also available without the heating element, for application with perimeter heating using baseboard, convector, or other types of heating systems.

More information? Circle Item 11 on postcard, page 105.

## Bypass Valve Cuts Maintenance

A new line of three-way bypass valves designed for accurate liquid flow control has been announced by the Johnson Service Co., Milwaukee, Wis.

Total capacity of the valve is constant, regardless of the position of the inner valve. Flow can be directed to either of two outlets as required. A tight closing feature makes these valves suitable for diverting applications which would ordinarily require the use of two separate valves.

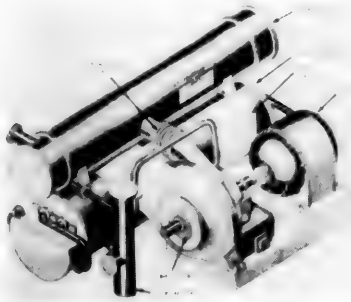
Maintenance is greatly simplified by a construction feature that makes it possible to change the discs and seat rings without removing the entire valve from the pipe line. Slamming and water hammer noise are eliminated by seating both discs against the flow.

The new valves, with molded rubber diaphragm operators, are available in 2½, 3 and 4 in. sizes. Other sizes are scheduled for production at an early date. Maximum pressures range up to 250 psi at 406 deg F and 400 psi at 70 deg F. Maximum control air pressure is 25 psi. Valves are furnished for either proportional or two-position control.

More information? Circle Item 12 on postcard, page 105.

## Centrifugal Compressor

Centrifugal compressors are being produced by Kathabar Div., Surface Combustion Corp., Toledo, Ohio, in sizes ranging from 200 to 2000 tons for comfort and industrial process air conditioning.



The units are of the overhung type with two stages, balanced back-to-back impellers and diffusers.

Automatically controlled adjustable inlet guide vanes provide stability and efficiency at loads from 20 to 100%. The use of the guide vanes permits constant speed operation with a squirrel-cage induction or synchronous motor with lower power input through the control.

Construction and performance data are available.

**More information? Circle Item 13 on postcard, page 105.**

## Power Pack for Air Filters

A new power pack designed especially for use with electrostatic air filters in room coolers is now available from the Specialty Transformer Department, General Electric Co., Schenectady, N. Y.

Providing the nearest approach to dust-free air yet attainable in the average home, the electrostatic filter-power pack combination is designed to remove dust, grime, soot, smoke, lint, and pollen from the air before it is circulated through the house. The system is designed to give nearly 100% pollen protection and better than 95% effectiveness in filtering out dirt.

In operation, the power pack builds up an electric charge on the filter and an opposite charge on the dust and pollen particles in the air. The two are thus attracted, and the tiny particles are captured as if drawn by a magnet.

The power pack has a low power consumption, with negligible electrical load and operating cost. It uses less current than three Christmas tree lamps, or about ten watts.

In cleaning out microscopic particles, the electrostatic system is more than 300% effective over ordinary mechanical filters.

The power pack's circuit contains an electrical filtering system to provide the proper electrical characteristics for an electrostatic air filter and to limit the output current under short circuit conditions. It operates on regular household circuits, 115 or 230 volts, 60 cycles. The unit transforms the power into high voltage and rectifies it, by means of either selenium or tube rectifier, to provide 3000 volts, d-c.

**More information? Circle Item 14 on postcard, page 105.**

## Heat Resisting Paint

An extra-high heat aluminum paint capable of withstanding temperatures up to 1700 deg F without blistering or burning is announced by Chem Industrial Co., Brooklyn, Ohio.

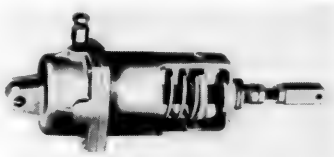
Termed C-I Extra High, it is composed of a clear silicone base with a special aluminum flake pigment. This combination air dries to a bright finish in approximately 30 minutes. Then, when heated, it is said to virtually fuse with the surface upon which it is applied. It forms a metal coating that resists moisture, corrosion, mild acids, alkalis and industrial fumes.

**More information? Circle Item 15 on postcard, page 105.**

## Fluid-Operated Motors

Air, water, or oil pressure can be used to power three gradual-acting diaphragm motors announced by the Powers Regulator Company, Skokie, Ill.

Motors are intended for gradual push-pull control of



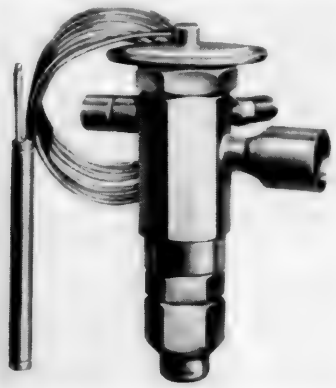
levers or rods on industrial equipment, as well as for heating, ventilating, and air conditioning control. Unlike conventional two-position air motors, the Powerstroke models permit an infinite number of shaft positions through the stroke range. Three-inch, 4-in., and 6-in. sizes are available, with respective thrusts of 80, 235, and 500 lb, and maximum strokes of 2⅛, 3, and 4⅛ inches.

In operation, air or hydraulic pressure on the molded neoprene diaphragm advances the spring-loaded piston. When pressure is relieved, the spring returns the piston to its starting position. Length of the piston's forward and return strokes, as well as the pressure required to start the motor, are easily adjustable over a broad range on all three motor sizes.

**More information? Circle Item 16 on postcard, page 105.**

## Thermostatic Expansion Valve

By utilizing an interchangeable power element, with a minimum number of parts and simplified construction, Detroit Controls Corp., Detroit, Mich., has developed the Detroit 714 gas-charged valve, a new large capacity thermostatic expansion valve that makes field service



easier. Discharged or damaged power elements are easily replaced on the job. All parts are easily disassembled and can be removed for inspection or replacement without removing the valve from the line.

Because of the interchangeable power element, this valve can be used with different refrigerants and for various capacities. Custom charges for air conditioning units, commercial and low temperature installations are available in the interchangeable power elements.

Incorporated in this valve for air conditioning applications is a new level action feeler bulb that gives a minimum of surge. This results in a power element that gives very close superheat control and maximum valve operating efficiency.

More information? Circle Item 17 on postcard, page 105.

## Plastic Pipe and Lining

Production of Teflon pipe and tubing and Teflon lined steel pipe has been announced by Haveg Industries, Inc., Wilmington, Del. Pipe is being made in sizes up to 4 in. diameter; lined pipe in 2 in. sizes.

This tetrafluoroethylene resin is completely inert to practically all chemicals, and is attacked only by molten alkali metals and fluorine at elevated temperatures and pressures. It is completely resistant to nitric, hydrochloric, sulfuric, hydrofluoric, and hydrobromic acids; also unaffected by highly oxidizing compounds such as aqua regia and sulfur or chlorine dioxides.

Relatively flexible, the material retains its toughness and flexibility over a wide range of temperatures. It is resistant to abrasion and thermal shock, and will withstand 150 psi over a wide range of temperatures even below —90 deg F., and is capable of continuous service to 500 deg.

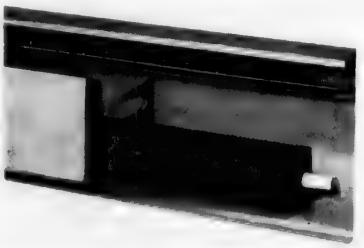
Teflon has low friction characteristics and few materials tend to stick to its surface. This non-adhesive asset makes it valuable in the handling of sticky materials. It may even be used to replace other materials in applications where there is a danger of food contamination and also need for a non-sticky surface. This fluorocarbon tubing has been primarily designed for use with steam or corrosive fluids and chemicals at high temperatures and pressures.

More information? Circle Item 18 on postcard, page 105.

## Baseboard Radiation

A new line of Rittling 580 baseboard radiation, which features a single unit design for installation including free standing, semi or fully recessed installations, has been announced by The Rittling Corporation, Buffalo, N. Y.

The enclosure is designed to secure maximum stacking effect and efficient air handling for maximum heat transfer. A specially designed adjustable deflector-damper is standard equipment.



The heating element uses 7/8 in. O.D. copper tube and rigid .017 in. steel fins. Fins are imbedded in tube to provide tight metal-to-metal bond and high heat transfer efficiency. Fins are 2 x 3 in. and spaced 48 per foot. One end of tube is expanded to simplify sweating adjacent sections without use of couplings.

Die-formed brackets support the heating element and front panel, and reinforce back and top. Brackets are notched to support a concealed 1/2 in. bypass or return line when it is desired to bring inlet and outlet connections out at one end. Brackets are spot welded to back of enclosure and spaced at various intervals so that one cut will give a wide range of element and overall lengths from the standard 8 ft lengths.

Standard end caps, with or without access door, are 4 in. wide and provide 3 in. adjustment; 4 in. snap-on joining pieces and wall trim strips also provide 3 in. adjustment.

More information? Circle Item 19 on postcard, page 105.

## Pipe Welding Electrode

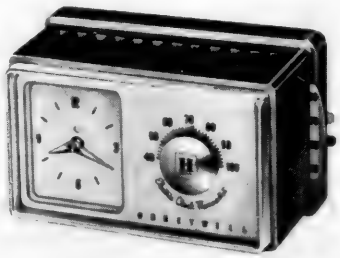
An electrode, the Fleetweld 5-P, that is suitable for all E-6010 applications, but designed for pipe welding, is offered by The Lincoln Electric Co., Cleveland, Ohio.

The electrode can be used for welding pipe, pressure vessels, X-ray applications, and other ASME code work. It also is suitable for all-position structural welding, machinery weldments, and ship welding. It conforms to AWS E-6010 requirements and is available in 1/8- and 5/32-in. diameters.

More information? Circle Item 20 on postcard, page 105.

## Electric Clock Thermostat

A new electric clock thermostat is available from Minneapolis-Honeywell Regulator Co., Minneapolis, Minn. The automatic model, designated T852 Chrono-



therm, features a gold body and a clear plastic-covered white face. The clock face and the temperature indicating scale have also been restyled in modernistic motif. The day-night control thermostat is the same size and rectangular shape of the former. The internal components are the same; however, the mercury thermometers for temperature indication have been replaced with a coiled bi-metal element.

More information? Circle Item 21 on postcard, page 105.

## Year-Round Room Units

A fan and coil room air conditioner for year-round air conditioning of hotels, office buildings, hospitals, schools, and other multi-story buildings is announced by Worthington Corp., Harrison, N. J.

A choice of recessed or cabinet type conditioners sup-

plies both heating and cooling in one unit, including air filtration and ventilation. The cabinet unit is designed for free standing under a window or along a wall. The recessed type unit is designed to be fully recessed in a wall under a window stool. The units are connected to a supply and return water piping system emanating from a remotely located central heating and cooling system which delivers the hot or chilled water.

Twin blowers in the unit draw room air through the filter, blend it with fresh filtered outside air, if desired, and direct the air over the coil where it is cooled and dehumidified during hot weather, or heated in cold weather.

Special features include a toe plate which eliminates the return air grille and allows for cleaning the room; a drain pipe constructed of steel and coated with mastic to protect against corrosion; and three types of discharge grilles: fixed stamped non-adjustable single deflection, adjustable single deflection, and adjustable double deflection.

Cooling coils are available in 4, 3, and 2-row design. A one-row steam coil for heating in existing buildings with satisfactory steam heating systems is also available.

More information? Circle Item 22 on postcard, page 105.

## Adapter for Straight Thread

An adapter has been made available by Parker Appliance Co., Cleveland, Ohio, to facilitate changeover from taper pipe threads to straight pipe threads in various applications such as valves or other units that are too large to be removed to a bench for re-machining of the ports. Interest is being shown in this adapter by operators of massive equipment where the hydraulic units are bulky and heavy.

Named the FG5-S, the *F* signifies a male pipe threaded end, the G5 indicates the internal straight thread O-ring boss on the other end, and the *S* denotes steel as the material. After the pipe threaded end is screwed into the valve port, it is welded for a permanent joint, leaving the other end of the adapter providing the new straight thread mounting boss.

More information? Circle Item 23 on postcard, page 105.

## Hand-Powered Stud Driver

Contractors can fasten to concrete or steel with a hammer by using the hand fastening tool made by Omark Industries, Portland, Ore.

The tool requires no power source such as cartridges, electricity or air. It concentrates the force of a hammer blow to the head of a hardened steel drivepin and can be used where a powder-actuated tool is not feasible.

A drivepin is inserted into the barrel of the tool from the bottom. A plastic washer holds the pin steady while it is being driven. A driving ram is pushed into the barrel from the top of the tool. The tool is then held securely against the receiving material while two or three hammer blows are struck on the driving ram head, which forces the drivepin into the concrete. The plastic washer disintegrates at the last hammer blow, leaving a clean fastening.

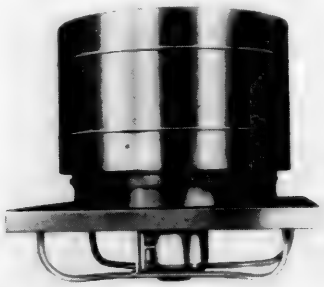
The hammer drive tool is used for light fastening to concrete, masonry, concrete or cinder block, and mild steel.

Four types of drivepins in more than thirty sizes are available. The tools are sold complete with driving rams and a metal carrying case.

More information? Circle Item 24 on postcard, page 105.

## Industrial Roof Ventilator

A new, Hi-velocity industrial roof ventilator featuring automatic damper blades, introduced by the Chicago Blower Corp., Chicago, Ill., has aluminum damper blades which pivot on maintenance-free bearings. The blades open wide with minimum fan pressure. When operating, the exhaust velocity keeps out rain, snow, and exhaust



reentry. The ventilator is completely weather tight in the closed position.

Airfoil shaped fan blades provide maximum thrust at lowest RPM. The easily installed fan operates on less electrical output because of high efficiency and lower speeds.

This fan can be equipped with a safety-vent fusible link which melts when subjected to intense heat, thus releasing the dampers.

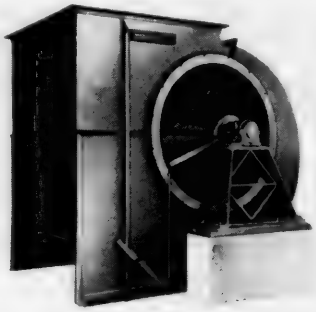
Blade diameters on the Hi-velocity fans range from 24 to 60 inches with exhaust capacities of 6640 to 53,700 cfm.

More information? Circle Item 25 on postcard, page 105.

## Heavy Duty Airfoil Fans

A new line of Airfoil centrifugal fans for heavy duty industrial applications is now available from American Blower Corp., Detroit, Mich.

The units may be had with single and double inlet construction in a large number of sizes for volumes up to 1,000,000 cfm. Airfoil blade design, plus improved design of streamline inlets, wheel rims and housing, con-



tribute to high efficiency. The new fans feature low operating cost and operate at a mechanical efficiency of more than 92% and static efficiency over 88.5%.

The wheel is of welded construction with blades of airfoil cross section, reinforced for additional strength. The hub of cast steel is riveted to the hubplate and bored to close tolerances for optimum fit on the shaft. The housing is of all-welded steel construction rigidly braced with stiffeners. A split section housing design facilitates wheel removal for inspection or maintenance. The shaft is of forging-quality steel which is normalized and tempered before being turned and ground to close tolerance.

Self-aligning sleeve bearings are furnished with the fans as specified. One fixed and one free bearing are used. They may be water cooled or air cooled as required. Sleeve bearing design is such as to permit sleeve removal from the housing without disturbing the bearing support. Oil ring lubrication is standard on sleeve bearings. The fixed sleeve bearing is furnished with two internal split-type thrust collars. Where high end thrust is anticipated, special split-bronze thrust rings are used between the ends of the sleeve and the thrust collars.

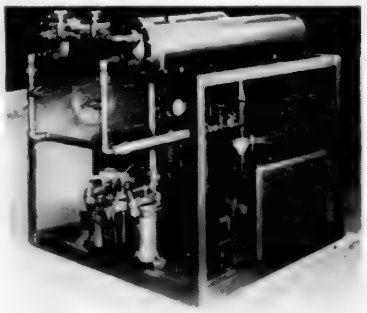
Volume control for the fans can be achieved with an adjustable speed fluid drive, inlet vanes, outlet damper or adjustable speed a-c motor.

More information? Circle Item 26 on postcard, page 105.

## Oil Heater-Pump Sets

Packaged combinations for preheating, straining, and pumping No. 5, No. 6, and Bunker C fuel oils are available in duplex (illustrated) or single assemblies from York-Shipley, Inc., York, Pa.

Each set is a self-contained unit, ready for operation as soon as connections are made to the fuel line and electrical service.



Manufactured for use with all burners designed to burn heavy oil, the pump and preheater assemblies come in four standard sizes: Model 100, pump size 2C, 100 gph, motor ½ hp; Model 225, pump size 3C, 225 gph, motor ¾ hp; Model 400, pump size 4C, 400 gph, motor 1 hp; Model 700, pump size 5C, 700 gph, motor 1½ hp.

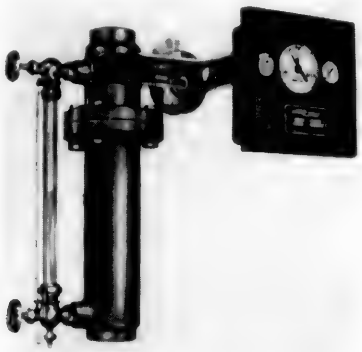
Equipment for single assemblies includes an oil preheater, a duplex oil strainer, fuel pump, motor, push-button magnetic starter, pressure gage reading from 0 to 160 psi, ¾-in. relief valve, sheaves and belts, fan-type temperature gage, check valve, and gate valve. These components are assembled and mounted on a steel base plate and frame. An aquastat and circulator for hot water or steam solenoid for steam are also furnished, but not mounted.

For duplex assemblies, two sets of most of the components listed above are provided.

More information? Circle Item 27 on postcard, page 105.

## Liquid Level Controller

A displacement type liquid level controller called Flexotrol, made by Kieley & Mueller, Inc., Middletown, N. Y., has eliminated bearings and knife edges to provide a trouble-free controller for all services.



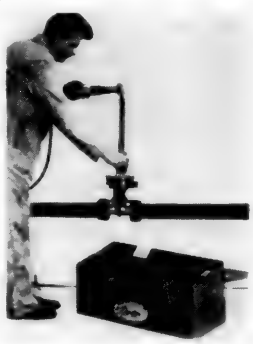
The new design introduces a torque table which replaces pivoting members. The face of the torque table, engaging and driving the torque tube, is free to twist under the action of the displacer. Since there is no dependence on sharp edges, performance of the controller is essentially constant and normal process residues do not hamper operation.

Unit is available with an external displacer chamber or in models for direct displacer immersion in the process vessel. As an optional feature, direct mechanical liquid level indication can be provided as a final and complete check on the pneumatic system. Direct reading scales simplify adjustment for a broad specific gravity range. Control action is interchangeable for proportional or differential gap response; proportional band is 1 to 150% with automatic reset as an extra feature.

More information? Circle Item 28 on postcard, page 105.

## Motor-driven Valve Grinder

Savings as high as 400% on labor, increased production, fuel and power gains are some of the benefits claimed from the use of the new motor-driven Dexter valve reseating grinder, a product of Leavitt Machine Co., Orange, Mass. It can regrind globe or gate valves from ¼ to 12 in. without removing the valve from the line.



Grinding elements, made in the form of cones and segments, are mounted on various size rubber coated grinding heads. By changing these grinding heads, the same machine can be used on various size valves.

The precision built machine guarantees accuracy by refacing irregular valve seats from the same reference point that was used by the manufacturer in machining the original seat. Strict adherence to this reference point makes the reground valve as tight as new.

The unit in compact kit form comes in three basic models for globe and gate valves.

More information? Circle Item 29 on postcard, page 105.

## Blowers for Furnaces

To meet the increasing demand for individualized blower mountings in warm air furnaces and air conditioners, a new Basic-Budget-Blower is available from the Lau Blower Co., Dayton, Ohio.

This blower will be used primarily in fully assembled heating and cooling units. Where formerly, the majority of these heating and cooling units were shipped from the factory unassembled, now most of them are completely manufactured and ready for installation as they leave the manufacturer's plants.

A manufacturer can mount this blower to fit his own particular design. Along with this, Lau will supply small parts in bulk such as grommets, tail piece straps, self tapping screws, Allen wrenches, bolts, and nuts.

The new Basic-Budget-Blowers in 9 and 10-inch wheel sizes will be shipped either in cartons or pallets. The 12 and 15-inch sizes will be shipped only in cartons.

More information? Circle Item 30 on postcard, page 105.

## Gun Cleans Condenser Tubes

A condenser cleaning tool that utilizes a gun-and-slug method to remove slime and scale is a product of Crane Packing Co., Morton Grove, Ill.

With the tool, one man can load an entire bank with cleaning slugs and shoot them through in rapid succession. The gun weighs 2¾ lb, so that an operator can use it for lengthy periods of time without fatigue. It can be operated by either air or water pressure. Effective pressures range from 50 to 200 psi.

Three types of cleaning slugs in sizes to fit all standard tubes can be furnished.

Spool-type slugs (left), for normal slime removal, are designed with a cup at the forward end which expands to wipe the inside of the tube clean. Bullet-shaped slugs (center) are for removing heavier or thick slime deposits. Scraper-type slugs (right) cut away scale or mineral deposits as they are driven through the tube. The latter two types have holes in the side wall to admit water or air for flushing away deposits as they are removed.

More information? Circle Item 31 on postcard, page 105.

## Device Pushes and Pulls Pipe

A device for pushing in water and gas lines and pulling copper or lead lines up to 3 in. in diameter under roads, streets, sidewalks, or lawns is being produced by Pow-r Devices, Inc., Clarence Center, N. Y.

Known as Pow-r Mole, the unit replaces the bucket on standard tractor-mounted, hydraulic backhoes using the 2-bucket mounting pins.

One man can dig the trenches, attach the unit, insert the pipe sections and operate the tractor hydraulics. Since the unit utilizes the power of the tractor to push or pull pipe, and down pressure on the backhoe boom stabilizes it while in operation, no other equipment such as air compressors, jack hammers, or winches is needed.

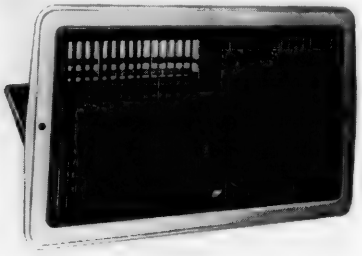
If a major obstruction is encountered when pushing pipe, the pipe can be pulled out and pushed in a different spot to avoid the obstruction. Direction is reversed by changing the position of two drag springs with no need to turn the tractor around.

The unit has a 4-in. stroke and operates at up to 30 tons pressure.

More information? Circle Item 32 on postcard, page 105.

## Air Conditioning Registers

Two types of registers are added to the No. 20 Series of air conditioning registers made by Air Control Products, Inc., Coopersville, Mich.



Designated 20-R (illustrated) for sidewall installation and 22-R for baseboard application, the registers are designed for jobs where ducts come down from the ceiling. Four way air control is maintained by adjustable, vertical, front fins and adjustable, horizontal, back fins, set at a 22½-degree downward deflection.

Dampers on the two registers pivot from the bottom, allowing air to enter from above. A setting permits balancing the damper at the register face.

The registers are finished in two-tone, chameleon beige, identical with the other models of the No. 20 Series. They are available in four sizes that include 8 x 6 in., 10 x 6 in., 12 x 6 in., and 14 x 6 in.

Additional information on the registers can be obtained from Bulletin 181-AC.

More information? Circle Item 33 on postcard, page 105.

## Bronze Welding Rods

Three extruded, bronze oxyacetylene welding rods are designed by Air Reduction Sales Co., New York, N. Y., for braze welding and welding malleable iron, cast iron, brass and bronze with dirty, oily or greasy surfaces.

Airco No. 20 bronze rod is recommended for general braze welding and regular welding; No. 22 manganese bronze rod for high strength welds; and No. 27 low fuming bronze rod.

The extruded rods are made in four diameters: $^1/_8$, 3/16, ¼ inch (36 inch long), and 3/32 inch (18 inch long).

The rods are also available with a dipped coating for clean surfaces.

More information? Circle Item 34 on postcard, page 105.

## Thermal Conductor

A line heater similar to an electric-heated wire is marketed as Thermal Catalytic Duct by Instrumentation Associates, New York, N. Y. It was designed for use in place of an electric heater where electricity is unavailable or too costly.

This duct uses a flexible metal hose in which a catalytic chemical reaction between air and hydrocarbon vapors

takes place. These vapors are supplied to the hose by a small pump or blower, power for which is furnished in electrical, chemical, or mechanical form. This power forces the reagent gases through the hose and is only a small fraction of the heat output.

The reaction in the conductor is repeatable, fully enclosed, and explosion-proof. It may be intermittent or continuous and the heat output can be accurately controlled. It requires no attention other than a periodic addition of a liquid fuel. The duct may be round or flat, and can be used straight, coiled, mounted to a surface, or wrapped around a body.

More information? Circle Item 35 on postcard, page 105.

## Earth Boring Auger

The Hydrozion Auger, designed and produced by the Hydrozion Engineering Co., Inc., Kansas City, Mo., is a hand tool where earth boring requirements range from 1 to 8 in. in diameter. Additional sizes up to 36 in. are produced upon request.

The Hydrozion Auger will drill through dirt, hard pan, clay, sandy loam, shale, gravel and roots for a distance up to 100 ft. Boring is at a rate up to 10 ft a minute.

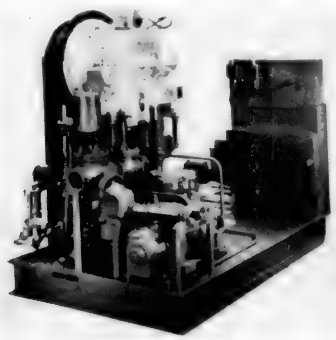
The auger consists of a driving unit and a bit. An electric drill (½ in. or larger) is attached to the driving shank, a section of ¾ in. pipe is attached to the opposite end of the unit and the proper size bit is coupled to the end of this pipe. A garden hose and stop is attached to the side of the driving unit and drilling commences.

More information? Circle Item 36 on postcard, page 105.

## Packaged Combustion Assembly

Complete packaged combustion assemblies utilizing gas, oil or combination gas-oil firing for modernizing or converting existing boiler or processing equipment is being marketed by Orr & Sembower, Inc., Reading, Pa.

The unit includes burner, automatic controls, forced-draft air supply, full modulation firing control, ignition,



complete piping and wiring and the refractory required for the burner throat. Complete flexibility of the unit permits use on furnaces and industrial equipment.

Various combinations of assemblies are available to meet any installation requirements without need for costly alteration.

The new product is identical to the firing system used on the company's automatic packaged boilers. Field testing has been complete on a wide variety of installations. The burner comes as a complete unit with components assembled at the factory into a single fuel burning system, simplifying installation on existing or new equipment.

Five sizes are available for maximum firing rates ranging from 3-million to 25-million Btu per hr.

The burner is designed to handle fuels ranging from light distillate through heavy No. 6 residual oil. Preheaters are an integral part of the heavy-oil assemblies. Manufactured, mixed, natural, bottled, or special gas fuels can be burned in the partial-pre-mixing design gas burner, which provides maximum flame stability and combustion efficiency. The oil-gas burner is a combination of the two, being immediately interchangeable from one fuel to the other.

More information? Circle Item 37 on postcard, page 105.

## Lighting and Diffuser Unit

A dual purpose lighting fixture which also serves as an air diffuser has been designed by the Pyle-National Co., Chicago, Ill. and the Benjamin Electric Manufacturing Co., Des Plaines, Ill. Called the Multi-Vent Trofferlite, it is adaptable to any drop-type ceiling. The air stream by passes the lighting tubes.

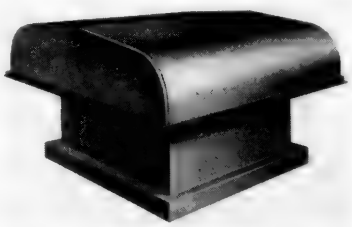
This fixture is said to make possible cleaner, more attracitve interior design, with lower initial cost; it increases light output and improves the quality of air conditionng. The single fixture reduces the number and variety of fixtures needed.

Dirt smudges on ceilings are eliminated.

More information? Circle Item 38 on postcard, page 105.

## Low-type Ventilator Unit

For roof ventilation where individual units of low contour are indicated. The Swartwout Company, Cleveland, Ohio, announces the Low-Line, a rectangular shaped



ventilator designed on the principle of deflecting expelled air downward to the roof. Eleven throat sizes are offered, in both gravity and powered models, the latter available also as a fresh air intake. Nearly 60 capacity ratings are available for the powered type, to meet almost any requirements.

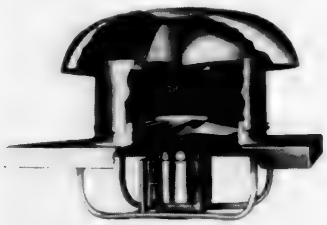
The unit has a hood hinged to open for cleaning or servicing. Exhaust or intake area is of proportions to provide free air movement without eddying or turbulence. The integral base mounts over a 4 in. curb to be built on the roof.

More information? Circle Item 39 on postcard, page 105.

## Axial Roof Ventilator

An industrial roof ventilator named Silent-Vent is introduced by Detroit Blower Co., Franklin Park, Ill.

Exhaust air leaving the ventilator's axial wheel spins upward where it is caught by guide vanes, which are an integral part of the head, and spun out into the atmosphere. This process combined with the low wheel tip speed reduces noise level and turbulence to a minimum.



The overall height of the mushroom-shaped ventilator does not exceed 1½ ft.

Fan blade diameters range from 9 to 48 in. The totally enclosed motors are mounted on rubber vibration isolators and supported by heavy gage pipe to provide minimum air flow resistance with maximum strength. Motor-fan outputs are reported by the company as being capable of exhausting 350 to 34,430 cfm of fumes, smoke and dust.

More information? Circle Item 40 on postcard, page 105.

## High Velocity Air Control

A control for high pressure and velocity air conditioning systems is introduced by Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.

Self-powered, the control is designed to give individual room or office temperature control of heating-cooling equipment which supplies air through dual (hot and cold) ducts at velocities of 4000 to 8000 fpm.

The control system permits balancing the air conditioning throughout a building by a dial adjustment.

In operation the thermostat exercises direct control over air volume rather than over the position of a valve. It supplies blended hot and cold air to each area at a constant rate of flow which is maintained regardless of changes in the air pressure throughout the air conditioning system. The rate of air flow is pre-set in cubic feet per minute according to the design of the system when the heating-cooling plant is installed.

The blender unit has a pair of valves in which balloon-like Neoprene diaphragms perform all operating functions. The system also includes a pneumatic thermostat and two air flow regulators. The hot air valve automatically controls the amount of heated air supplied according to demands from the thermostat. The cold air valve automatically adjusts total air flow to maintain the pre-set cfm. Inflation and deflation of the diaphragms in the two valves controls the amount of air through the ducts.

The system can be used with ceiling, sidewall, or under-the-window air outlets and in larger work spaces several blender units can be controlled from one thermostat.

More information? Circle Item 41 on postcard, page 105.

## Gas or Oil-Fired Boilers

The marketing of two new series of gas or oil fired boilers is announced by Bryan Steam Corp., Peru, Ind.

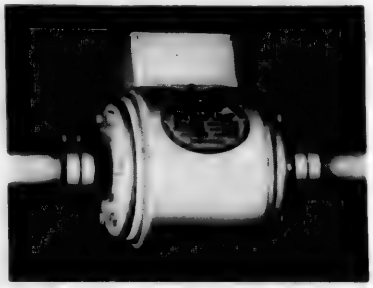
Circulation area of the new 400 and 500 series boilers has been increased by approximately 100% by the replacement of the normal ¾ in. OD copper tubes with full one inch OD tubes. This larger tube makes the circulation less critical to restriction while also increasing tube life. The copper tubes have also been redesigned with a long straight connection at the lower section to provide for easier cleaning.

Capacities up to 1,080,000 Btu are available in a one-piece, assembled and wired unit in the new 400 series. All four of the 400 series boilers are available in the packaged unit or in optional knocked down, or assembled but not wired assemblies.

More information? Circle Item 42 on postcard, page 105.

## Water Circulator and Pump

A hot water circulator and booster pump, named Dyna-pump, is announced by Fostoria Pressed Steel Corp., Fostoria, Ohio. It is said to provide better flow, improved baseboard performance, and faster response to heating demands.



The unit is magnetically driven. Pump and motor are wholly enclosed to eliminate the need for lubrication. The circulator boasts leak-proof shaft seals, is practically noiseless in operation, and carries a two-year guarantee.

More information? Circle Item 43 on postcard, page 105.

(*Continued on page* 130)

# Random Thoughts from a Filter Engineer

*by James Stahn, Sales Engineering Department*

- **WHICH OF YOUR AIR FILTERS DESERVE A GOLD WATCH?**
- **THE AIR FILTER BUSINESS MUST BE PROFITABLE!**
- **FAST MAN WITH A GUN CAN BE DEATH ON FILTERS**

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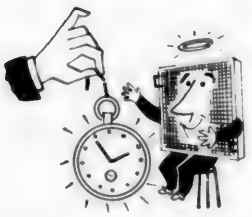
### WHICH OF YOUR AIR FILTERS DESERVE A GOLD WATCH?



Don't laugh, many people today are robbing themselves...blind. They're paying out good, hard cash for filtering air . . . but getting short changed.

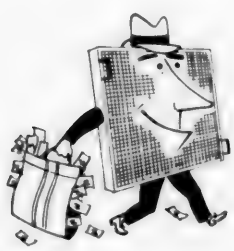
As a filter manufacturer, we keep an eye on what goes on in our industry. It's surprising what turns up. For example, over half the filters in use today are ten years and older. In fact, we often come across filter panels bought before World War II. And that's at least 15 years ago.

True, a good filter is like a good car. Take care of it and it could last forever. That's why some filters are in as good condition today as when they were first built. But frankly, many, many filters that appear to be in good shape should be given a gold watch and retired! Why? Because in the past decade, giant strides have been taken in filter design—advances that make today's filters vastly more efficient than those of yesteryear. So, if you don't have the most modern filter units available, chances are the ones you have are actually costing you more money than it would take to replace them.

On the other hand, of course, are obvious, visible reasons for retiring filters. Your filters may have rusted out because the proper adhesive hasn't been used. Or they may have been dropped or bent so that they can't seal properly. All of which adds up to dirt and dust leaking through that you're shelling out good money to filter.

Better take a minute to check your filters for signs of old age. Maybe you're one who is paying for new filters every day. Our representative will be glad to help you check. Why not give us a call—today?

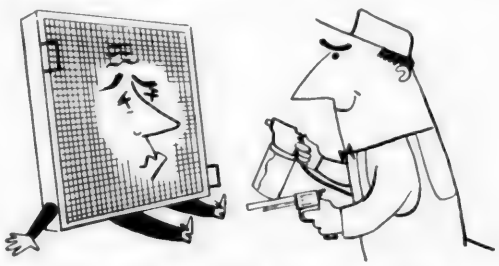
### THE AIR FILTER BUSINESS MUST BE PROFITABLE!



At least that should be your impression, based on the large number of new filter manufacturers springing up. We heard of three new ones last week!

We wouldn't be honest if we said we were pleased. However, we know increased competition is inevitable and it spurs the entire industry to make better filters.

The important point we would like to make is that there is no substitute for experience in the filter business. During the last 31 years, there are few problems we have not encountered. Many of them we have solved. This background and know-how is a part of every Air-Maze filter you buy. Occasionally our filters may cost a little more (the best usually does), but you can be sure they are thoroughly field-proven in many thousands of applications.



### FAST MAN WITH A GUN CAN BE DEATH ON FILTERS

All of us like the "eager beaver" especially when maintenance costs are so darn important. But here's a case when being "penny-wise" turns out to be "pound-foolish".

One of our men was called in to find out why a filter wasn't filtering. All the impingement-type filters were clean and clamped tightly in place. There were no leaks for air to by-pass the panels. Yet the evidence showed that dirt was getting through.

After going through the system with a fine-tooth comb, our man noticed one "eager-beaver" renewing the adhesive on filter panels. Instead of following the service procedure the manufacturer specified, the maintenance man thought he was saving a lot of time by spraying on the adhesive. Well he was, and if this wasn't bad enough, he was giving the panel the lick-and-a-promise treatment to save adhesive.

What happened? Only the outside of the filter got coated. As you'd expect, the inside was bone dry allowing most of the dirt to pass right through. No wonder the filter wouldn't filter.

The object lesson, of course, is that regardless of whose filters you use, follow the manufacturer's instructions to the letter. He's gone through all the possible troubles before and knows what is takes to insure the best filtering job. The Air-Maze Corp., 25000 Miles Road, Cleveland 28, Ohio.

AFI MEMBER AIR FILTER INSTITUTE

**AIR-MAZE**

***The Filter Engineers***

AIR FILTERS • SILENCERS • SPARK ARRESTERS
LIQUID FILTERS • OIL SEPARATORS • GREASE FILTERS

(*Continued from page* 128)

## Alarm for Unsafe Conditions

A remote visual and audible alarm, the Larm-Tector Model 50, is announced by Way-Wolff Associates, Inc., New York, N. Y., for use in connection with smoke controls, low water cutouts and flame failure systems, or wherever an alarm is required to indicate the presence

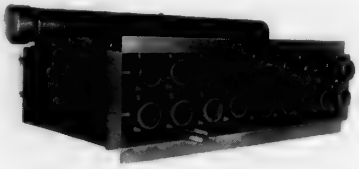
of unsafe or other conditions. It has a red alarm light, an audible buzzer of exceptionally loud intensity, an adjustable time delay switch, together with a push-button and silencing relay circuit. The complete unit measures 4 in. long, 4 in. wide, 3⅜ in. deep. It is for operation on 110 volts, 50 or 60-cycle; a transformer permits operation on other voltages.

By automatically resetting itself after each operation, the device insures that the alarm will resound on the next indication that an unsafe condition occurs. When such a condition occurs, first a red light comes on, then after a delay of 30 seconds, the buzzer sounds. The silencing pushbutton can be pressed any time after the red light is energized to de-energize the audible alarm only. The time delay switch is adjustable anywhere from a no-delay to a maximum of 2 minutes. As an added safety feature, the unit cannot be permanently disconnected from the circuit by an operator or attendant.

**More information? Circle Item 44 on postcard, page 105.**

## Inshot Gas Burners

A new line of inshot atmospheric type gas burners introduced by Ray Oil Burner Co., San Francisco, Calif., are designed to burn natural, manufactured or mixed



gases in commercial and industrial applications. The number and arrangement of nozzles permit flexibility in design and capacity where requirements demand high input rating in limited space.

Capacities on the various sizes range from 99 cfh on 1000 Btu gas to 7512 cfh. Special features include Ray Tandem-Jet Nozzles and the Ray Flame Retention Ring.

Electronic safety control equipment is standard. Low-fire start is provided on all sizes. Modulation, while standard on larger sizes, may be specified for smaller sizes if desired.

**More information? Circle Item 45 on postcard, page 105.**

## Pipe Strap

A new type of metal strap that snaps on pipe, rigid and thinwall conduit is available through Holub Industries, Inc., Sycamore, Ill.

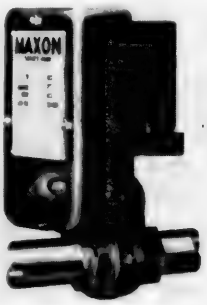
It is claimed that this new strap permits neater, faster installations because it does not have to be held in place. It is particularly good for overhead work, or hard-to-reach jobs. According to the manufacturer, further savings can be made by using these straps and spot welding for installation to steel frame work.

The secret of the snap is a bump inside the strap. As the strap is pressed on, the bump causes a slight springing action which holds the strap firmly in place. Ribbed construction adds to the snap and provides rigid support. Straps, which are made of heavy gage steel and zinc plated, are available in six sizes from ½ to 2 in. for thinwall conduit, and seven sizes from ⅜ to 2 in. for rigid conduit and pipe.

**More information? Circle Item 46 on postcard, page 105.**

## Automatic Gas Valve

An automatic gas valve has been designed by Maxon Premix Burner Co., Muncie, Ind., to reduce explosion hazards in boiler firing.




Designated Series 4600, the valve has a dual release mechanism that provides a double safeguard against mechanical failure, both mechanisms operating simultaneously and each causing the valve to close whenever there is any interruption in the electric safety circuit.

The valve's electric drive unit has its transmission and bearings immersed in oil. The internal parts include a disc and seat that are heat-treated and lapped. The valve disc shears off small quantities of dirt, pipe scale, welding beads, or other foreign matter frequently found in actual operating conditions.

Described in bulletin No. 8700-56, the valve is available in sizes from 1 to 6 in., standard pipe sizes.

Approved by the Factory Mutuals and by Underwriters' Laboratories, the valve is suitable for automatic on-and-off firing of boilers and similar applications where the gas control valve must operate many times a day.

**More information? Circle Item 47 on postcard, page 105.**

(*Continued on page* 132)

Main offices and plant of Pratt & Whitney Aircraft, East Hartford, Conn., in which Sarco Heating Specialties are installed. These Sarco products are used by all divisions of United Aircraft Corporation.

# 35 repeat orders from United Aircraft

## *for Sarco Heating Specialties!*

First installation in 1933. Thirty-five installations since. That's the 22-year record of Sarco Heating Specialties in plants and office buildings of all United Aircraft Divisions.

35 *large* repeat orders... won by Sarco proved dependability!

Several thousand Sarco steam traps and other Sarco Heating Specialties are on the job at:

*Pratt & Whitney Aircraft Div.*, East Hartford, North Haven and Southington, Conn., *Hamilton Standard Division*, Windsor Locks, Conn., *Sikorsky Aircraft Division*, Bridgeport and Stratford, Conn.

For further information on Sarco heating specialties, Sarcotherm weather-compensated control systems for steam and hot water heating, and Sarcofin finned-tube and baseboard radiation, write Sarco Company, Inc., Empire State Building, New York 1, N.Y.

**SARCOfin Radiation**

**...another Sarco product**

**APPROVED RATINGS** – by Institute of Boiler and Radiator Manufacturers for finned-tube and baseboard radiation.

**1-YEAR GUARANTEE** against defects in materials and workmanship.

**COOPERATION** – careful selection of radiation by experienced Sarco and Sarcotherm heating engineers.

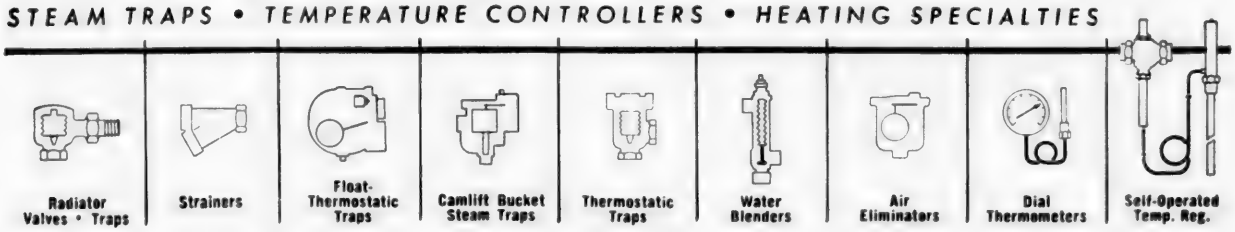
*Write for Bulletins*

# SARCO

*Sarco quality assures satisfaction*

2131-B

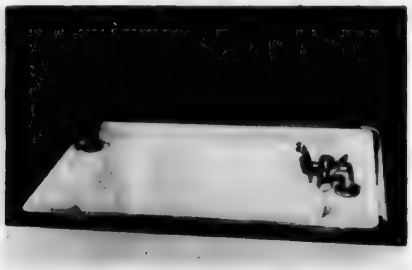
STEAM TRAPS • TEMPERATURE CONTROLLERS • HEATING SPECIALTIES



(*Continued from page* 130)

## Combined Fountain and Receptor

A combination drinking fountain and receptor, designed for installation in schools, institutions, commercial buildings and residences with utility rooms, is announced by Plumbing and Heating Div., American Radiator & Standard Sanitary Corp., New York, N. Y.



Called the Ledgeworth, the dual-purpose fixture has a range of uses in addition to being used as a drinking fountain and glass filler. In schools, it can be used by teachers and pupils to clean paint brushes or moisten modeling clay. The fixture, coated with acid-resisting enamel, also can be used to clean laboratory equipment, to water flower pots or fill aquariums.

The combination fixture is available in two sizes—30 by 20 in. and 24 by 18 in.—with an inside depth of 7¼ in. A brass bubbler finished in Chromard is mounted on the right front ledge. A matching goose-neck supply fitting is mounted on the left rear ledge. The brass fittings and strainer are vandal proof.

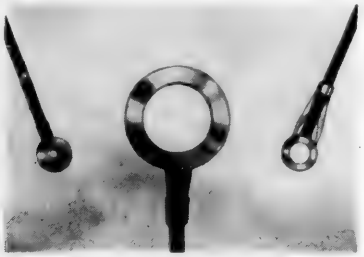
The fixture is designed for counter-top installation with standard mounting frames. The fitting mounting surfaces are designed to meet code requirements.

The fountain bubbler can be obtained with a self-closing feature and an automatic volume regulator. The glass filler also can incorporate the self-closing feature with both automatic volume and stream regulator. The fittings also are available with an aerator.

**More information? Circle Item 48 on postcard, page 105.**

## Miniature Gasket Thermocouples

Miniature gasket-type thermocouples in many gasket sizes are made by Thermo Electric Co., Inc., Saddle Brook, N. J. Designed originally for use beneath spark plugs of internal combustion engines, gasket thermocouples are now used extensively to measure skin temperatures, in chemical and food processing, metal working, atomic energy and many other industries.

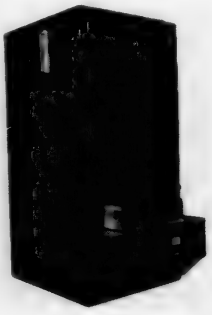


T-E gasket thermocouples are available in three ranges: —300 to +600 deg F. with copper-constantan calibration and copper gasket; 75 to 900 deg with iron-constantan calibration and copper gasket; and 900 to 1200 deg with iron-constantan calibration and stainless steel gasket. Gaskets in the form of standard SAE plain, medium washers come in 14 different hole sizes from 5/32 to 1-1/16 in. I.D.—also 10, 14 and 18 mm diameters. Fiberglass insulated leads are supplied plain or with stainless steel overbraid, and are equipped with a large variety of terminals.

**More information? Circle Item 49 on postcard, page 105.**

## Oil Mist Precipitators

Precipitators of oil mist and smoke generated by high speed grinders, screw machines, and lathes are manufactured by Electro-Air Cleaner Co., Pittsburgh, Pa., to lower plant heating and cooling costs.



The precipitator includes new features such as selenium rectifiers, and a single, ballasted circuit. It has a five-year parts guarantee.

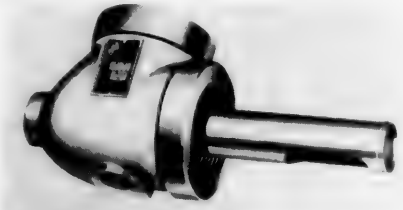
• Six models with either horizontal or vertical air flow are being manufactured in capacities of 800, 1350, and 2000 cfm. A single unit can be mounted over one machine or in connection with a bank of high speed grinders or screw machines. Each unit is furnished as a complete package.

Catalog OM-40 and price lists are available.

**More information? Circle Item 50 on postcard, page 105.**

## Air Control for Boiler

A boiler fitting for side outlet boilers is introduced by Bell & Gossett Company, Morton Grove, Ill., to trap air at the boiler.



It is part of the Airtrol System which has two patented fittings, the boiler fitting and the tank fitting. The Airtrol boiler fitting traps air at the boiler as it is released through heating, and directs it to the compression tank. The tank fitting enables the installer to start up the system initially with the proper air level in the tank. In operation, the tank fitting prevents air from leaving the tank and returns it to the system.

**More information? Circle Item 51 on postcard, page 105.**

(*Continued on page* 134)

Lord & Taylor branch store, West Hartford, Conn., has network of Beth-Co-Weld steel pipe for chilled water system. *Contractor:* The Horton Co., Hartford. *Jobber:* Callahan Company, Hartford.

## New Store in Connecticut...Office Building in North Carolina

# BOTH USE BETH-CO-WELD PIPE

Whether it's for a store, or office building, or some other type of structure, you can count on good service when you use Beth-Co-Weld steel pipe for heating and plumbing lines, and for sprinkler systems.

Beth-Co-Weld is ideal general-purpose pipe because it is so easy to work and install. Besides, it is made from a good grade of steel by the continuous-weld process, ensuring a tight, sound weld.

Most jobbers carry Beth-Co-Weld in these sizes:

| DIAMETER | WEIGHT | LENGTH |
|---|---|---|
| ½ to 4 in. | Standard | 21 ft, plus or minus 1 in.; |
| ½ to 3 in. | Extra Strong | also random lengths |

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

Owned by Home Finance Group, Inc., this structure in Charlotte, N. C., has Beth-Co-Weld steel pipe throughout. *Contractor:* Embree-Reed, Inc., Charlotte. *Jobber:* Noland Co., Spartanburg Branch.

BETHLEHEM STEEL

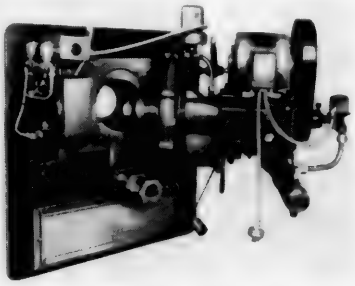
# BETHLEHEM STEEL

(*Continued from page* 132)

## Combination Gas-Oil Burner

A combination gas-oil burner has been announced by Enterprise Engine & Machinery Co., San Francisco, Calif. This Type AY burner is available in 12 sizes from 4 to 200 gph for oil and for gas 600 to 30,000 cu ft per hr.

Ring type burner features a spudless gas ring that is recessed inside a cast iron nozzle protector. Construction



of the unit permits quick and easy installation from outside the furnace. With the converging nozzle protector acting as a form for refractory materials, the burner may also be removed from outside the furnace without disturbing the firebox lining.

The entire assembly and all piping are outside the firebox. The spudless ring design results in a simpler, compact arrangement of the air-oil-gas linkage. Transfer from one fuel to the other requires merely the operation of a fuel selector switch.

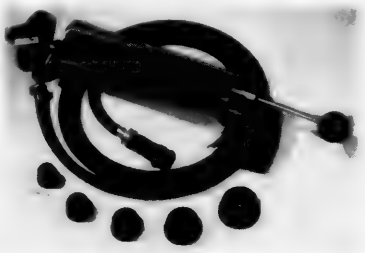
This burner, which has passed Underwriters' Laboratories, Inc., acceptance tests, is listed for all grades of fuel oil, and city or L-P gas.

More information? Circle Item 52 on postcard, page 105.

## Adaptor Plugs for Hydraulic Ram

A set of five tapered rubber adaptor plugs will be furnished as standard equipment with each Hydraulic Water Ram, made by The Hydraulic Mfg. Co., Kiel, Wis. The tool is used for cleaning clogged drains, pipes and sewers.

These tapered adaptor plugs range in size from 2⅝ in. x 2¼ in. down to 1⅜ in. x 1 in. They are especially designed to enable the ram operator to obtain the maxi-



mum effective seal when applying the ram against drain blockages. The result of using the adaptor plugs is reduced recoil when the slug of compressed air is fired. The slug of compressed air has more direct forward action.

Using a self-contained pump plunger, the operator compresses the air in the ram chamber to approximately 60 to 80 lb as required. The ram is then inserted into the drain opening which is to be cleared. Upon pulling the trigger, the slug of compressed air delivers a split-second impact which readily clears the most stubborn drain block including those which ordinarily would require replacement of pipe. The impact of the ram not only clears complete obstruction, but also clears out lines which are only partially blocked up through an accumulation of waste or grease.

More information? Circle Item 53 on postcard, page 105.

## Solder Fluxes

Non-corrosive, quick wetting solder fluxes, designed primarily for use on copper and copper base alloys, are being manufactured by Federated Metals Div., American Smelting and Refining Co., New York, N. Y. The fluxes utilize safe-to-handle derivatives of the war-born chemical, hydrazine, and are known as Federated H-Series solder fluxes.

The fluxes have the following characteristics: Small mounts of flux residues are non-corrosive; solder spread characteristics; almost no residue produced; washing or cleaning can be eliminated; prefluxing for production economies is possible.

The fluxes promote solder spread over a range of temperatures, reducing oxides to free metal as the temperature of the work is raised above 375 deg F. During the soldering operation the flux decomposes and vaporizes, leaving essentially no residue.

More information? Circle Item 54 on postcard, page 105.

## Swivel Split-Flange Coupling

The Flanco 4-bolt split-flange pressed-on coupling made by Anchor Coupling Co., Inc., Libertyville, Ill., is now available with 360 deg swivel joint for convenience in positioning and installing. This swivel, combined

with the no-thread, no-leak features of the coupling design gives the engineer new design freedom and prevents danger of hose twisting. It eliminates pipe threading, use of separate union and swivel connectors, gaskets and sealing compound.

It is available in all sizes from ½ through 1½ in., and in all standard bends from 0 to 90 deg. Thinner sections on valve and pump bosses are made possible. Only small automotive type wrenches are needed to make-up a joint.

More information? Circle Item 55 on postcard, page 105.

(*Continued on page* 136)

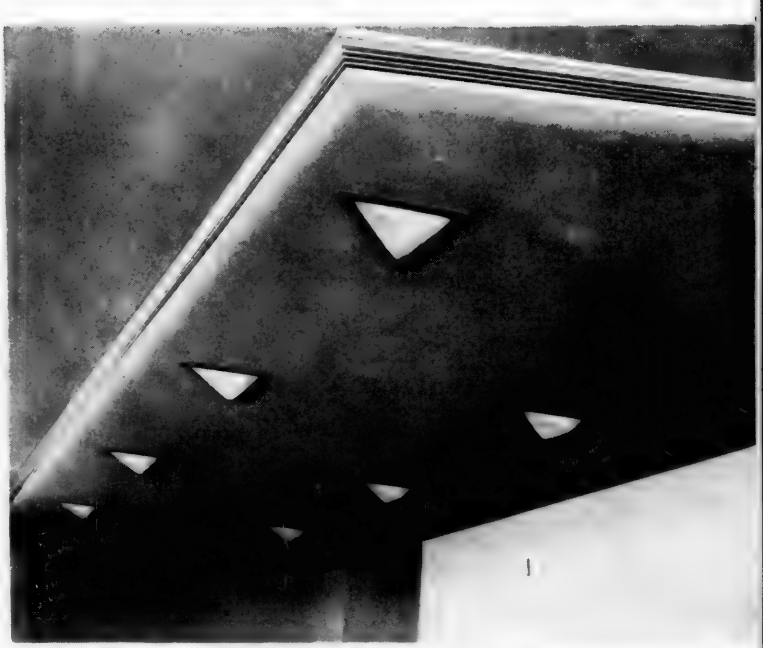
*Meeting the architect's concept*

*Price Tower: Bartlesville, Okla.*
Architect:
Frank Lloyd Wright
Engineer:
Mendel Glickman
• Consulting Engineers:
Collins & Gould
General Contractor:
Culwell Construction Co.

# High velocity air diffusion in the Price Tower

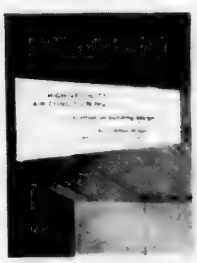
The photograph at the right shows how Mr. Frank Lloyd Wright incorporated Anemostat Straight Line All-Air High Velocity Units in the ceiling design of the Price Tower at Bartlesville, Oklahoma. The conditioned air is supplied through continuous Straight Line Diffusers located on two sides of the suspended ceiling. The diffusers do not only have vital functional use, but also add to the esthetic appearance of the architect's design.

The Anemostat All-Air High Velocity distribution system also offers important advantages. It can be used with smaller than conventional ducts. It can be installed in less time and at less cost. It requires no coils, thus eliminates leakage, clogging and odors. Furthermore, Anemostat round, square and straight line diffusers with high velocity units are adaptable to a wide variety of architectural designs.



PHOTOS: JOE D. PRICE

See how Anemostat Straight Line All-Air High Velocity units are used in a typical office area.



*Write for "High Velocity Air Conditioning: Its Effect on Building Design" to Anemostat Corporation of America, 10 E. 39 Street, New York 16, N. Y.*

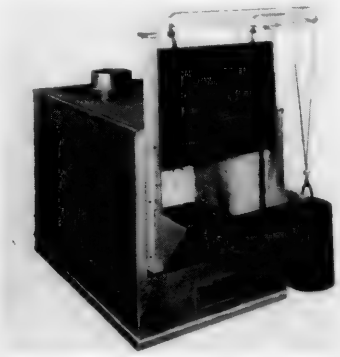
Anemostat—The Pioneer of All-Air High Velocity Systems

AC 1349

(*Continued from page* 134)

## Industrial Incinerators

Industrial incinerators (Model WC-6) are being made by Winnen Incinerator Co., Bedford, Ohio, on special order in any size and with optional features to meet the particular requirements of the user.



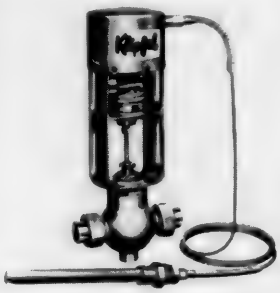
Suitable for installation indoors or out of factories, schools, restaurants, hospitals, and apartment buildings, the incinerator is lined with firebrick to withstand temperatures exceeding 2500 deg F. It has cast-iron grates and a sheet steel casing finished in heat-resistant aluminum paint.

Special equipment is optional, such as automatic firing control, pre-fabricated chimneys and breeching, overfire burners, and electronic controls. Three different types of doors are available: Guillotine (illustrated), double-leaf sliding doors, or double-leaf hinged doors.

**More information? Circle Item 56 on postcard, page 105.**

## Self-actuated Regulator

A new self-actuated vapor pressure temperature regulator, has been developed by Klipfel Valves, Inc., Hamilton, Ohio. Named the Golden Genie, the regulator is suitable for the control of hot water tanks instantaneous heaters and steam tables. It also offers precision control for oil preheaters, as well as cooling for diesels, and cooling jackets of compressors or engines.



An extra-powerful bellows actuator is connected by capillary tubing to a temperature sensitive bulb. The actuator is mounted on top of a yoke connected to the valve. The bellows supplies the power for controlling the valve opening in response to the temperature changes at the bulb.

The bulb is placed in the tank or other location where desired temperature is to be maintained. The valve is installed in the pipe line supplying steam, water, gas or other fluid to be used for heating or cooling.

The regulator is completely self actuated. Strong, long lasting two-ply bellows operates at a higher working pressure with a smaller bulb. It develops more power for valve actuation, and cannot be overextended. A bellows overheat protection provides against damage when the bulb is accidentally subjected to temperature in excess of range.

**More information? Circle Item 57 on postcard, page 105.**

## Fibrous Insulation

Basaltwool, a new fibrous material made from basalt volcanic rock, has good acoustic and heat insulating properties. Produced in Sweden, this material is now available to United States manufacturers through Thermo-Sound Products, a division of Kittell-Lacy, Inc., El Monte, Calif. Fibers are approximately 20 microns (.00078 in.) in diameter and vary in length from 18 to 36 inches. This long fiber length permits it to be used in mat form without the use of a binder. Fibers are gathered in batt form and stitched with wire. No binder of any kind is added.

Other advantages of this remarkable new material are listed below:

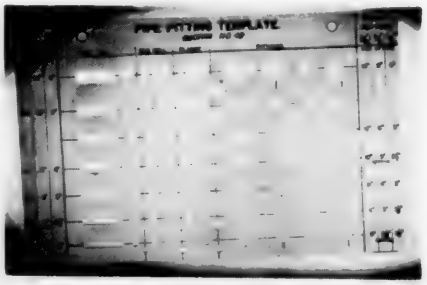
Exhaustive tests have shown that Basaltwool will withstand temperatures up to 1700 deg F. for short periods without breaking down.

It is comparable to other fiber insulating materials in *K* factor, but can be used in installations subjected to much higher temperatures than other fiber products. Batts come in densities from 3 to 6 lb per cu ft, and in widths and thicknesses for most heat and sound insulating applications.

**More information? Circle Item 58 on postcard, page 105.**

## Piping Symbols in Six Scales

The most commonly used pipe fittings symbols have been condensed by A. Lawrence Karp, Greenwich, Conn., onto a single template whose two imprinted tables permit the user to transpose in six different scales.



On the 5¼ x 8-in. condensed version, ninety-one symbol apertures have been cut through rigid, transparent, Vinylite with professional regard for accuracy, dimensional stability, and pencil tolerances. A range of commonly used symbols for OD pipe, end bells, flanges, and fittings is covered; foreshortened views are also included. Printed tables relate the symbols to ⅛, ¼, ½, 3/16, ⅜, and ¾-in. scales.

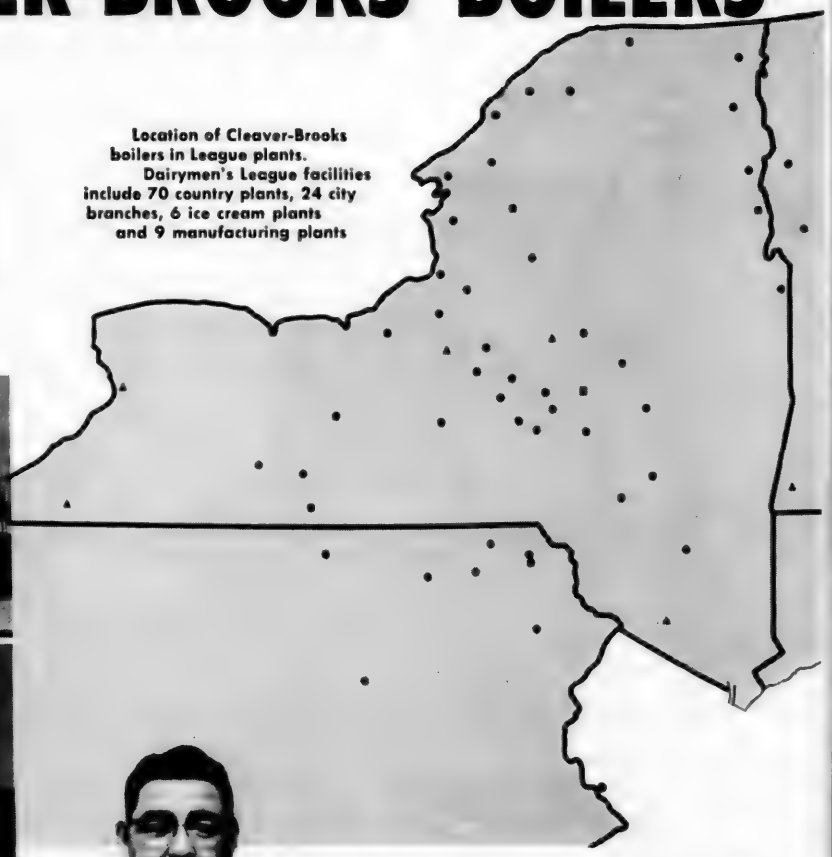
**More information? Circle Item 59 on postcard, page 105.**

(*Continued on page* 138)

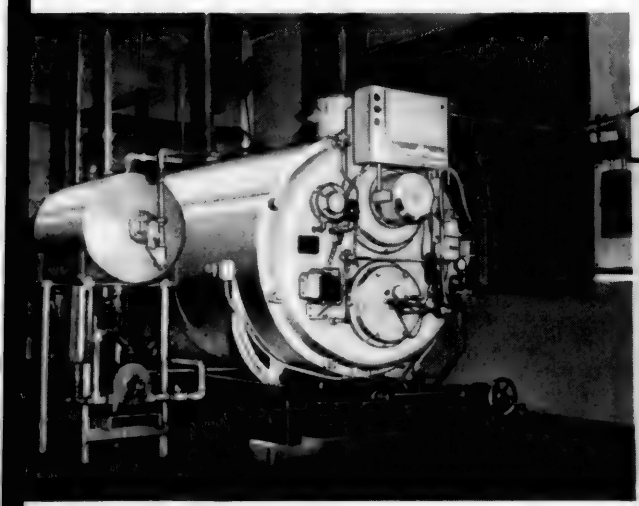
## One of America's largest and leading dairy associations uses

# 69 CLEAVER-BROOKS BOILERS

**Special note to dairymen:**
See Cleaver-Brooks boiler exhibit at the Dairy Show, ATLANTIC CITY Oct. 29 — Nov. 3. Booth W.50



Location of Cleaver-Brooks boilers in League plants. Dairymen's League facilities include 70 country plants, 24 city branches, 6 ice cream plants and 9 manufacturing plants



**MILTON, PA.** — This country plant is supplied with quick, dry steam from a Cleaver-Brooks 60 hp light-oil fired CB boiler.

"Our 69 Cleaver-Brooks boilers are a key part of our production — their unusually high efficiency, sanitary, clean operation have helped us grow and prosper", says Ken Dodge, staff engineer for Dairymen's League Cooperative Association.

"Maintenance is low. We average far less than one service call per boiler per year," he adds.

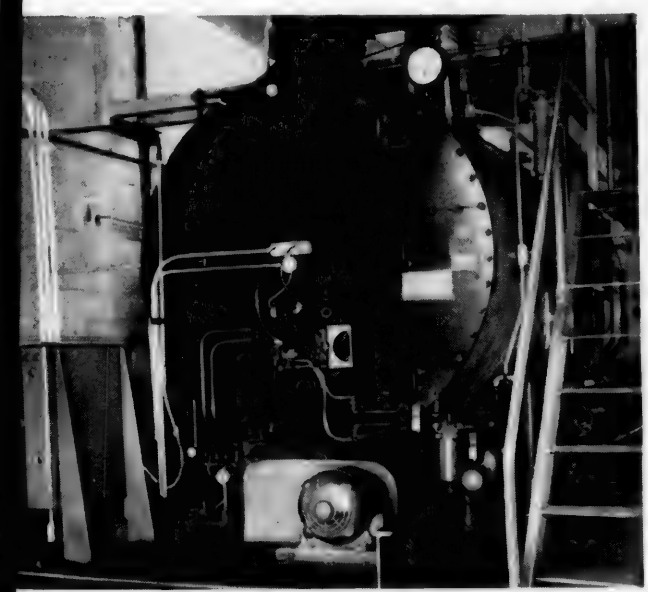
Dairymen's League Cooperative Association, serving 25,000 dairy farmers and thousands of consumers in New York, Pennsylvania and New Jersey, has been a steady user of Cleaver-Brooks boilers for 20 years.

Like any dairy company, the League finds steam essential for the production of quality dairy products. Their boilers are the work horses of their plants — supplying steam for pasteurizing, heating, cleaning and processing.

And Cleaver-Brooks boilers, with their exclusive four-pass, forced draft design and clean, quiet operation are especially suited to dairy plant operation.

Famous dairies the country over are profiting with the many advantages of Cleaver-Brooks boilers, available in a complete line. You can select from 110 models in 18 boiler sizes, 15 through 600 hp . . . oil, gas and combination oil and gas fired.

For more information contact your nearby Cleaver-Brooks representative. Or write Cleaver-Brooks Company, Dept. L, 315 E. Keefe Avenue, Milwaukee 12, Wis. Cable Address: CLEBRO — Milwaukee — all codes.



**UTICA, N. Y.** — In this city plant a 250 hp LR heavy-oil fired boiler provides all steam for pasteurizing, cleaning, heating and processing.

**Cleaver Brooks**

**ORIGINATORS OF THE SELF-CONTAINED BOILER**

(*Continued from page* 136)

## Chain Wrench

A new line of chain wrenches has been announced by The Toledo Pipe Threading Machine Co., Toledo, Ohio. Designed for rugged use and long life, the new wrenches are especially useful for close corner work on pipe sizes up to 6 in.

The wrench jaw is constructed so that the greater the force on the handle, the tighter the grip. The rugged chain will fit round, hex, square and all irregular shapes. These tools are available in two models, ½ to 4 in. and 3 to 6 in. The chain wrench may be used effectively for holding or turning operations and will not scratch or mar surface of pipe or object held.

More information? Circle Item 60 on postcard, page 105.

## Air Cooled Condenser

A remote-type Freon condenser, air cooled, and said to be the largest on the industrial market, is made by Refrigeration Appliances, Inc., Chicago, Ill.

Air is drawn through the coil on the counter-flow principle, providing a more even distribution of air and making for an efficient use of the condenser coil surface.

Available in units from 1 to 45 tons, the condenser operates on nominal ratings based on 110 deg F condensing temperature.

The coil element is constructed of copper tubing and bonded aluminum fins. The tubing is electro-tin-plated to resist corrosion. All steel coils, hot-dipped galvanized after fabrication, can be furnished for special applications.

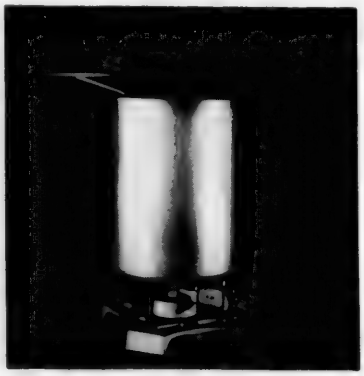
Enclosed, ball bearing motors and rust resistant fan blades are located inside a galvanized sheet steel housing. The motors are mounted on a specially designed platform, so belt adjustment can be semi-automatically performed without the necessity of entering the unit. External alemite fittings make the greasing of fan and motor bearings a simple operation.

The condenser is available in a variety of models.

More information? Circle Item 61 on postcard, page 105.

## L-P Salamanders

A new line of L-P salamanders was introduced by Weldit, Inc., Detroit, Mich. On the underside of the dome is set a Weldit Thermo-Disc made of malleable iron. It is located directly above the flame, and intensifies heat and adds to the efficiency of radiation.

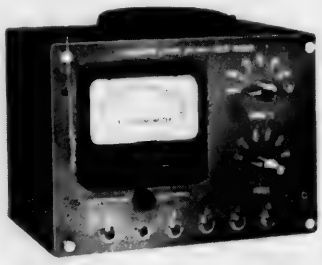


The new salamanders are available in 3 models: No. 300, high pressure floor type; No. 1850, high pressure tank top; No. 900, low pressure floor type with 100% automatic safety shut-off.

More information? Circle Item 62 on postcard, page 105.

## Multi-range Tele-Thermometer

A five-range Tele-thermometer, Model 46, is made by the Yellow Springs Instrument Co., Yellow Springs, Ohio. Covering 30 to 110 deg F with five overlapping ranges, each 20 deg F wide, this direct-reading instrument has



an absolute accuracy of ±0.25 deg F. Other ranges are available. This portable unit is powered by a self-contained mercury battery lasting for over 2000 hours of operation. Any combination of the company's completely interchangeable thermistor probe types can be used, remotely or locally, including air temperature, stainless steel tubular immersion, flat surface temperature, and internal body types.

More information? Circle Item 63 on postcard, page 105.

(*Continued on page* 140)

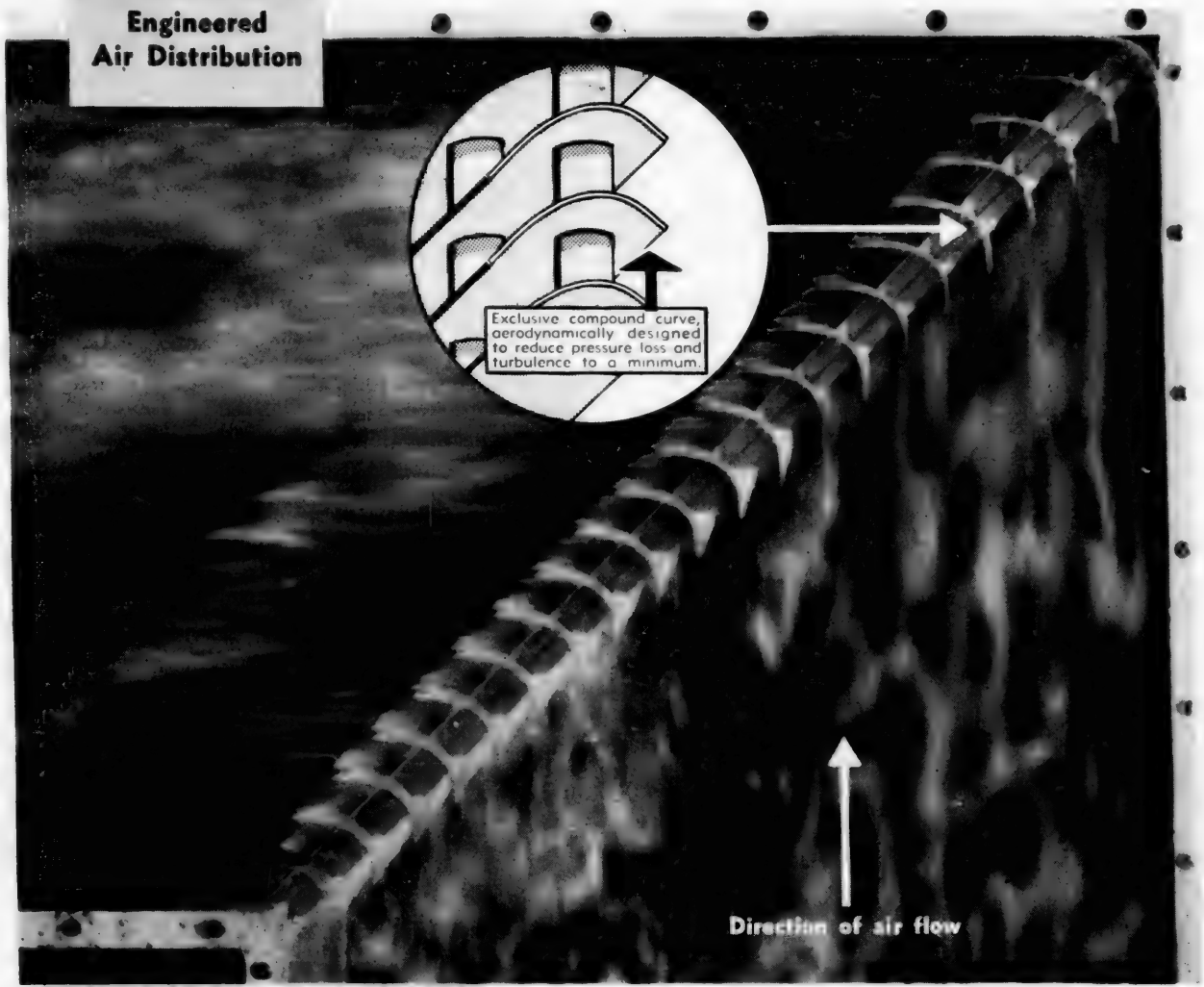
THE MARK OF QUALITY

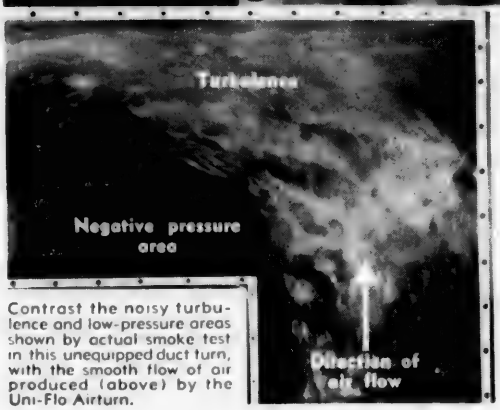
BARBER COLMAN

uni-flo

Engineered Air Distribution

# Multiple-radius vanes of Uni-Flo AIRTURN® make air behave in ducts


Exclusive compound curve, aerodynamically designed to reduce pressure loss and turbulence to a minimum.
Direction of air flow




Contrast the noisy turbulence and low-pressure areas shown by actual smoke test in this unequipped duct turn, with the smooth flow of air produced (above) by the Uni-Flo Airturn.

For minimum noise and maximum efficiency of air movement in square duct turns, specify the Barber-Colman Uni-Flo Airturn. Laboratory data and field experience prove that the exclusive Barber-Colman vane design is the most effective available. The Uni-Flo Airturn gives sweeping radius performance to square duct corners, permitting installation economy in ductwork and operating savings at the fan. Sturdy, rattle-free assemblies in sizes 48 in. x 48 in. immediately available, specific sizes made up to meet individual job requirements. Get complete specifications from our nearby Field Office or write us today.

**Barber-Colman Company**

DEPT. J, 1102 ROCK STREET, ROCKFORD, ILLINOIS, U. S. A.

(*Continued from page* 138)

## Recorder-Controller

A line of pressure and temperature recording controller and recorders has been added by A. W. Cash Company, Decatur, Ill.

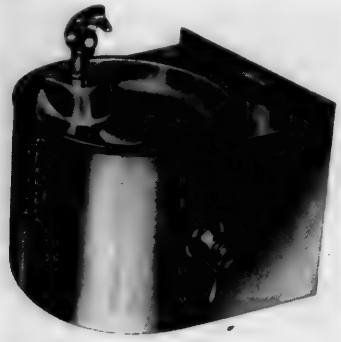
The Type 57 pneumatic recording controller controls and records both pressure and temperature. Available models have either 9 or 12 in. spring or electric driven charts and on-off, duplex on-off or 1-100% proportional action. Pressure ranges are from 0-5 to 0-5000 psi (0-25,000 psi for 12 in. single pen only) and temperature range is from —350 to 1200 deg F.

More information? Circle Item 64 on postcard, page 105.

## Drinking Fountain

A stainless steel drinking fountain is introduced by Haws Drinking Faucet Co., Berkeley, Calif.

Designated Model 7W, the fountain features 18-gage stainless steel, No. 4 finish.



The fountain's styling emphasizes rounded surfaces, which hide waste and supply fixtures and which blend with contemporary architectural planning.

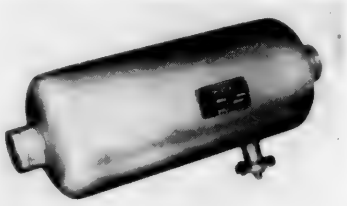
The unit contains an automatic flow control valve with a lever handle to assure a constant pressure, controlled angle stream. The chrome plated brass fountain head is raised and shielded to prevent mouth drippings from touching the orifice and to eliminate direct mouth contact.

More information? Circle Item 65 on postcard, page 105.

## Mufflers Separate Oil from Gas

Combination oil separators and mufflers for refrigeration systems are made by Heat-X, Inc., Brewster, N. Y.

Designated OSM, the units silence system noises and separate oil entrained with the hot gas from the compressor. They are also equipped with a mechanism which automatically returns to the crankcase all the oil that is separated.



The manufacturer points out that the ratings of the units are based on tonnage rather than on horsepower, in order to permit matching the units to requirements.

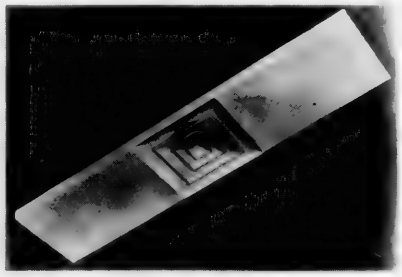
The new units have no floats which can hang open or stick closed. A positive action velocity pressure mechanism opens only when the compressor is running and closes of its own weight when the compressor stops.

Constructed to ASME specifications, the units are available in a capacity range from 1 to 75 tons F-12 and 1 to 100 tons F-22.

More information? Circle Item 66 on postcard, page 105.

## Modular Ceiling Panel-Diffuser

A diffuser extended into a metal panel for use with Acousti Line Pan ceilings, Security Panel ceilings or similar arrangements has been announced by Anemostat Corp. of America, New York, N. Y. Known as the Anemostat EP diffuser, it is designed to facilitate changes in air distribution requirements and allow the distribution system to be fully integrated with the ceiling design.



The diffuser, a standard square diffuser extended into a metal panel of the same dimensions as ceiling panels, can be used in an octopus distribution system, in which supply air is fed to the attenuator chamber at high velocities, and distributed at low velocities through flexible metal tubes to as many as four ceiling diffusers. The panel diffusers may be shifted without alterations of the ductwork when tenant requirements call for outlets to be relocated. These diffusers are available in 12 x 24 inch or 12 x 48 inch panels.

More information? Circle Item 67 on postcard, page 105.

# NOW!

## FOR THE FIRST TIME

### REVERE *brings you Color-Coded Copper Water Tube for faster, positive identification ... in the warehouse ... on the job.*

Now, even when the lighting is inadequate and the personnel inexperienced the various types of Revere Color-Coded Copper Water Tube can be identified in a twinkling. In addition it will simplify taking of inventory, checking bills of lading and shipping tickets and double-checking against building specifications.

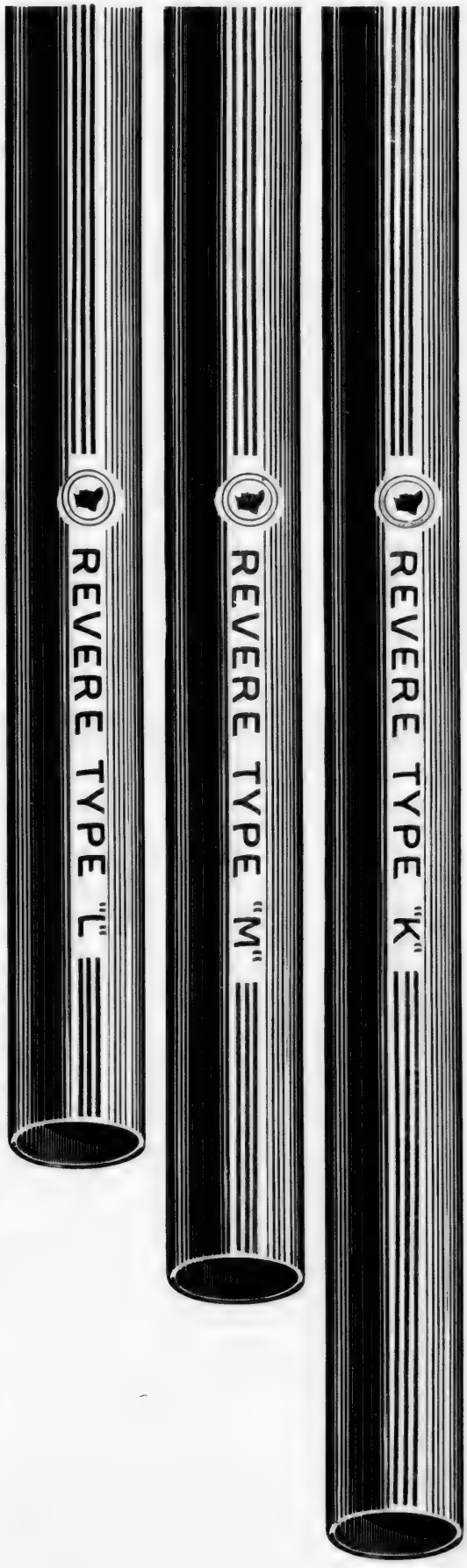
Markings shown at right, run the full length of the 20-foot tubes, and are spaced about every 12 inches. In addition to the 3 shown, Type DWV will be color-coded yellow and Type TP will be gray.

Inks used will remain fast while tube is being handled but will not interfere with soldering when normal cleaning procedures are used.

These color-coded markings are in addition to the present incised marking appearing every 18 inches as required by ASTM.

Cartons in which coiled Revere Copper Water Tube is shipped are also being stamped with the new color coding identifications.

For a top quality water tube that's more convenient to use make sure you specify "REVERE!"




**REVERE COPPER AND BRASS INCORPORATED**

*Founded by Paul Revere in 1801*

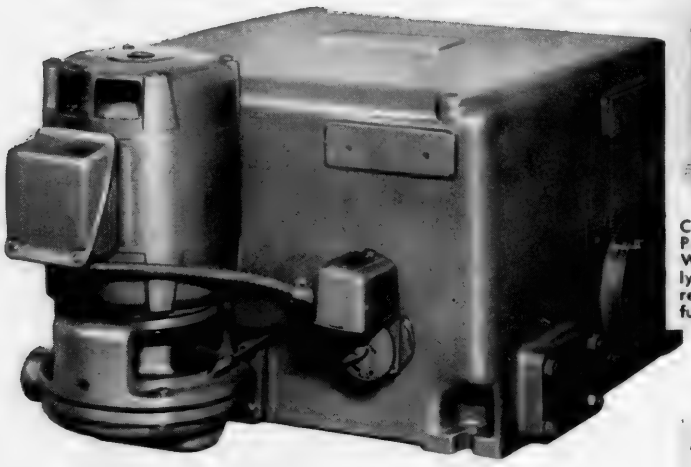
230 Park Avenue, New York 17, N. Y.

COPPER ★ BRASS ★ 18 01 REVERE ALUMINUM

*Mills: Baltimore, Md.; Brooklyn, N. Y.; Chicago, Clinton and Joliet, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Newport, Ark.; Rome, N. Y. Sales Offices in Principal Cities, Distributors Everywhere.*

# HOFFMAN

## CONDENSATION PUMPS



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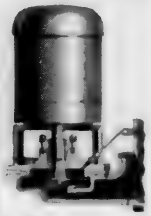


Cross section of Pump assembly. Water flows directly from cast iron receiver into centrifugal pump.

Single & Duplex Units—Ratings through 150,000 sq. ft. E.D.R. Watchman Pump—a small compact unit for capacities of 500 to 8,000 sq. ft. E.D.R. and 20 lbs. Discharge Pressure.

***featuring*— • Compact Design • Low Suction Velocities • Bronze Fitted throughout • Stainless Steel Shaft • No piping between pump and receiver • Rigid motor support for quiet operation • Cast iron receiver**

Motor and Pump unit is designed vertically to place the motor high above the floor—away from dirt and water. Standard ball bearing motors are used.

**A COMPLETE LINE OF STEAM AND**

F&T Traps

Steam Vents

Supply Valves

---

## SLOTTED OR SQUARE FOR CONDITIONED AIR

**KNO-DRAFT SLOTTED AIR DIFFUSERS:** handsome extruded aluminum in modules of 2, 3, 4 or 6 feet. Install singly or butted in series to form continuous diffuser line on wall or ceiling. Adjustable one-directional flow for small areas; multi-directional flow for larger areas. Exclusive Kno-Draft adjustable air direction vanes. Grid-type volume control. Damper grids equalize air distribution over length of diffuser.

**KNO-DRAFT SQUARE AIR DIFFUSERS:** sturdy pressed steel, aluminum finish. Capacities from 50 to 1250 cfm. Eight sizes for easy overlap installation in acoustical or plastered ceilings or snap-in installation in T-bar ceilings. All units geometrically proportional so that, at constant neck velocities, static pressure is same for all sizes. Precise, *circular* diffusion patterns over large area assured.

For complete performance and selection data on Kno-Draft Square and Slotted Diffusers, write to Connor Engineering Corporation, Dept. J-106, Danbury, Connecticut.

CONNOR ENGINEERING CORPORATION

**kno·draft®**

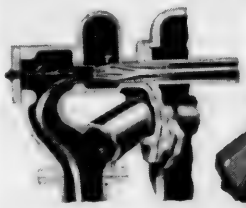
**Square and Slotted Air Diffusers**

# HEATING PUMPS

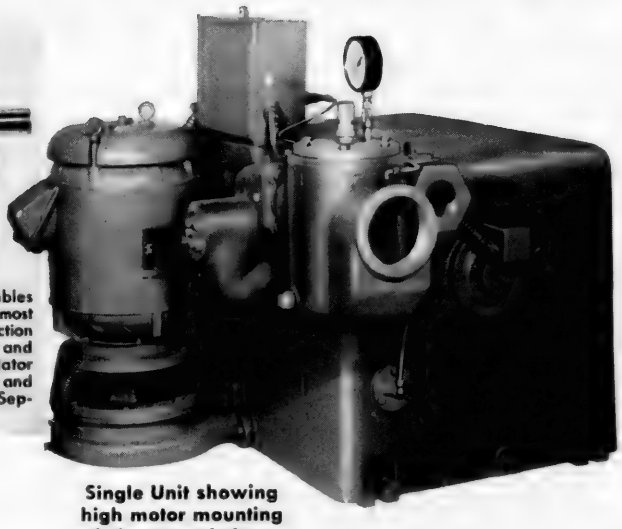
## VACUUM PUMPS

Single and Duplex Units—Ratings through 100,000 sq. ft. E.D.R. Hoffman famous Jet Vacuum Producer assures greater efficiency—low upkeep. Cuts operating time and power bills approximately ½.

**• Engineered to remove up to 300% of rated capacities of air at start of heating cycle • Shorter warm-up period means economies • Standard Capacity for ordinary requirements—Special Capacity where larger air and water capacities are necessary • Cast iron receiver**

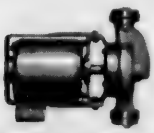


Jet Vacuum Producer enables Hoffman Pump to handle almost boiling water. Cross section view shows air, vapor and condensate from Accumulator Tank entrained by Jet and being discharged to Air Separating Tank.



Single Unit showing high motor mounting and close coupled pump

## HOT WATER HEATING SPECIALTIES



Circulating Pumps

Balancing Elbows

Water Vents

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# Airsan Viro Crimp

## HIGH VELOCITY AIR FILTERS

**VIRO CRIMP MEDIA**
has special Hemmed Edges for strength and safe, easy handling. No cuts! No Scratches! No Filter surface damage.

AFI MEMBER AIR FILTER INSTITUTE

- MAXIMUM EFFICIENCY (288 — 510 FPM)
- MINIMUM RESISTANCE
- NO DIRECT AIR PASSAGE
- LARGE DUST HOLDING CAPACITY

***Also Available . . .***
**Low Velocity and Grease Filters.**
**Write for catalogs and prices.**

## Air Filter Corporation

108H NORTH WATER ST. • MILWAUKEE 2, WIS.
Canadian Representative
DOUGLAS ENGINEERING CO., LTD., MONTREAL

**A few distributorships available.**
***Write for details!***

why
Architects
and Engineers
—as well as Contractors and Owners—
prefer
ALLENCO
designed to suit your design
because:
it's easier to specify just what is best
for each *individual* project;*
you *know* you'll get all that you specify;
Allenco *serves* better, *looks* better,
avoids waste of cost, time, space.

★A.I.A. file 29e2 gives most thorough easy-to-find data on components, custom-size cabinets, complete systems ...includes ready-to-use standard and alternate specs. Write for your copy; meanwhile check Sweets.

# NEW CATALOGS

Use the prepaid postcard on page 105 for securing your copies of catalogs described in this department.

**AUDITORIUM UNIT VENTILATOR** — Available from Herman Nelson Unit Ventilator Products, American Air Filter Co., Inc., Louisville, Ky., is a special bulletin describing the AUDIvent auditorium unit ventilator. Included in this bulletin are a number of sketches which show the various ways this ventilator may be installed. ..... **Item 68**

**REMOTE COOLER CATALOG**—Catalog 560-6a on Recold RE remote air conditioners is offered by Refrigeration Engineering, Inc., Los Angeles, Calif. The catalog lists the dimensional changes to the unit and gives the specifications for three sizes. ..... **Item 69**

**WATER COIL SELECTION**—A 4-page bulletin has been issued by Drayer-Hanson, Div. National-U. S. Radiator Corp., Los Angeles, Calif., to show a simple method for selecting water coils for cooling. Easy to use charts and a method of calculation are included in the booklet. ..... **Item 70**

**TUBING FOLDER**—Engineers and others involved with the problem of determining the proper specifications to apply to various carbon, alloy and stainless steel tubing, pipe, seamless welding fittings and flanges are offered a 4-page folder (TDC-186) published by Tubular Products Div., The Babcock & Wilcox Co., Beaver Falls, Pa. The folder is a cross reference between the steel, the application and the specification covering the product. Reference specifications are those of the ASTM, AAR and special specifications covering the products mentioned. ..... **Item 71**

**WATER SOFTENER BULLETIN** — A low-cost water softener is featured in a bulletin compiled by The Duro Co., Dayton, Ohio. The bulletin is printed in two colors and includes a selection table listing all pertinent data on four models. ..... **Item 72**

**MOTOR DRIVES** — How to select variable speed drives to meet specialized requirements is covered by Worthington Corp., Harrison, N. J., in an 8-page bulletin. Motor drives which range from ½ to 25 hp are available with explosion proof motors and can be mounted on the floor, wall or ceiling. ..... **Item 73**

**AIR DIFFUSERS**—New products that have been issued by Anemostat Corp. of America, New York, N. Y., are described in a 12-page bulletin which is illustrated with performance charts, drawings and photographs. Products include a number of special type air diffusers. ..... **Item 74**

Use the prepaid postcard on page 105 for securing your copies of catalogs described in this department.

**WATER HEATER CATALOG**—All of the standard lines of commercial and industrial storage water heaters made by The Patterson-Kelley Co., Inc., East Stroudsburg, Pa., are the subject of Catalog 19. Tab-indexed for easy reference, the 48-page catalog has been revised to include the latest provisions of the 1952 ASME Code for unfired pressure vessels (U-69). It is recommended for use by architects, consulting engineers, mechanical and general plumbing and heating contractors. .....**Item 75**

**INSULATION** — Performance and uses of Microlite insulation are described in a 4-page booklet issued by L.O.F. Glass Fibers Co., Toledo, Ohio. The booklet contains thermal and acoustical performance charts and the many uses of the insulation are described. .....**Item 76**

**REGISTERS AND GRILLES CATALOG**—Catalog No. 54 illustrates and describes the line of registers and grilles manufactured by Standard Stamping & Perforating Co., Chicago, Ill. Included are perimeter floor registers, perimeter baseboard registers, register and grille frames and two new ceiling diffusers. Grilles in stamped ornamental designs are included in the catalog. .....**Item 77**

**BOILER WATER LEVEL CONTROLS** — Two pieces of literature, a condensed catalog and a new service guide, published by McDonnell & Miller, Inc., Chicago, Ill., cover the line of boiler water level controls, relief valves and boiler water safety devices available from this company. The condensed catalog has been expanded from four to eight pages and gives more detailed selection information, and includes new pump controls and relief valves. The service guide contains extensive trouble shooting and service data. .....**Item 78**

**UNION BROCHURE IS OFFERED**—A brochure describing the features of bronze-to-bronze seat, malleable iron unions is offered by Dart Union Co., Providence, R. I. Complete with illustrations of the unions and union fittings, the brochure is available from the company's general sales agent, The Fairbanks Co., New York, N. Y. .....**Item 79**

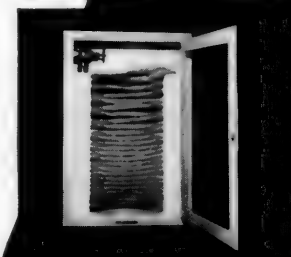
**COOLING MANUAL**—A comprehensive and well prepared 48-page manual on cooling in connection with automatic heating is published by International Heater Co., Utica, N. Y. Includes information on types of equipment, refrigerants, plenums, installation, connecting, charging procedure, wiring diagrams and allied information. .....**Item 80**

**DUAL PURPOSE DIFFUSER** — A multi-vent Trofferlite serves as a lighting fixture and also for air diffusion for an air conditioning system. A booklet has been issued jointly by Benjamin Electric Mfg. Co. and The Pyle National Co., both of Chicago, Ill., describing this fixture. .....**Item 81**

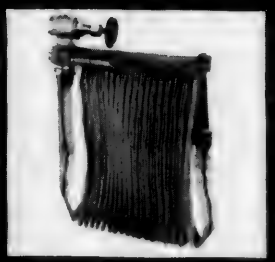
(*Continued on page* 146)

"write your own ticket" with ALLENCO
widest selection and many exclusive items

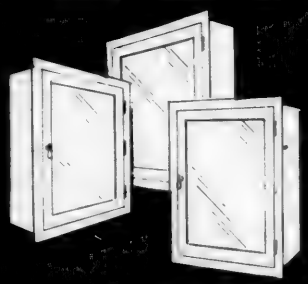
Novel HOZEGARD Reel combines hose protection, fastest action and economy. Ideal for industrial applications. Requires no wall work.



First practical cabinet for Cotton Rubber Lined hose, increasingly demanded. Compact, fully protective, yet avoids harmful tight folds.



Improved hose rack tests more than twice as strong as others, safe against vandalism...foolproof, quick-acting. Perfect for housing projects.



"Custom-size" cabinets in wide range of sizes and 3 price ranges to suit each individual application. No mis-fits, no waste of space or funds.

True dimension, sure-square, more rigid construction makes installation faster, cheaper, neater. Doors open and close easier, permanently.

Smooth surfaces blend into your walls. Finished corners and tight joints help keep out dust. Your clients will agree Allenco **looks** better, too.

**W. D. ALLEN MANUFACTURING CO.**
Allenco Building, Room 710 • 566 W. Lake Street, Chicago 6
Sales Offices in Principal Cities

**specify ALLENCO and get it!**

DO YOU HAVE A TWO-STAGE PRESSURE OR TEMPERATURE CONTROL PROBLEM

MERCOID® HAS THE SOLUTION

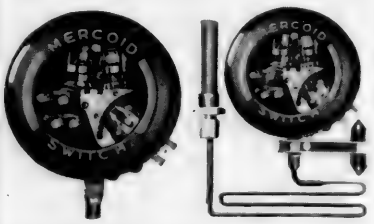
Mercoid DA-400 Series Controls are dual purpose controls (available for pressure or temperature) incorporating a single element operating two separate independently adjustable Mercoid magnetic mercury switches. Circuit arrangements can be supplied for various operations, a few examples are:

*1. Close one alarm circuit at high setting and a separate circuit at low setting. Both circuits remain open between the high and low operating points of the two switches.*

*2. As an electrical interlock to open one circuit on a rise above, and the second circuit on a drop below the set operating point.*

*3. To provide two-stage control by opening one circuit on a rise and a second circuit on a further rise.*

*Pressure types* available in 17 different operating ranges from 0-30" vac. to 300-2500 psi. *Temperature types* available in 11 operating ranges from -30-60°F. to 370-530°F.



All types are equipped with external adjustments and visible calibrated dial.

Our engineers are at your service—send in your control problem or

WRITE FOR BULLETIN CA-PT

THE MERCOID CORPORATION
4211 Belmont Ave., Chicago 41, Ill.

# NEW CATALOGS

(*Continued from page* 145)

Use the prepaid postcard on page 105 for securing your copies of catalogs described in this department.

**DATA ON SCOTCH BOILERS**—Catalog AP-295 gives descriptions, dimensions, and engineering data, to help in specifying and installing the Scotch type boilers made by Pacific Steel Boiler Division, Johnstown, Pa. Thirteen sizes of the boilers are listed, with SBI steam rating at 240 Btu per hr ranging from 5470 to 42,500 sq ft. The SBI water rating at 150 Btu per hr is from 8750 to 68,000 sq ft. .....**Item 82**

**VALVE PARTS CATALOGS** — Parts catalog FPL-11, released by the Henry Valve Co., Melrose Park, Ill., consists of 32 pages of detailed cross-sections and parts, together with list prices, covering Freon valves and accessories, including packless and packed valves, check valves, strainers, driers and liquid level gages for refrigeration, air conditioning and industrial application. Parts catalog APL-11 also available is a 24-page booklet covering ammonia valves. .....**Item 83**

**PACKAGED WATER CHILLERS** — American Blower Corp., Detroit, Mich., has made available a 16-page booklet describing the combination packaged water chillers which come in ten sizes from 20 to 150 tons. Complete selection data are presented for each of these sizes. .....**Item 84**

**HEAT TRANSFER APPLICATIONS**—Described and illustrated in Bulletin 1P-356, issued by Tranter Manufacturing, Inc., Platecoil Div., Lansing, Mich., are 14 installations in which Platecoil heat transfer units were used to solve a variety of industrial problems. Specifications and dimensions are listed for four styles. .....**Item 85**

**FLEXIBLE PLASTIC PIPE** — Specifications for Supplex flexible polyethylene plastic pipe are presented in Bulletin CE-57 issued by Supplex Co., Div. American Hard Rubber Co., Garwood, N. J. It shows applications suitable for this type pipe and has a chart listing industrial liquids that may be carried through this piping. .....**Item 86**

**ELECTRIC MOTORS BULLETIN**—A line of performance rated electric motors available in 48 frame and 56 frame from 1/20 to 1 hp is presented in catalog 1-1P1 published by Century Electric Co., St. Louis, Mo. The 10-page catalog contains detailed information explaining the features of open motor construction and totally enclosed motor construction with cutaway views of the units. Mechanical variations available are described and illustrated with application examples given. .....**Item 87**

**PANEL CONTROL SYSTEMS** — The line of Fireye Series AC panel control systems for automatic oil, gas and combination oil/gas burners is described and pictured in a new 16-page bulletin available from Electronics Corporation of America, Combustion Control Div., Cambridge, Mass. Designated Bulletin CA-22, it contains information on each packaged control system for both commercial and industrial burners. Included is application, operation and component data, as well as dimensions. A selector guide is also presented to select the appropriate panel control system. .....**Item 88**

**BACK DRAFT DAMPER**—A 4-page bulletin, BD-56, issued by the Rittling Corp., Buffalo, N. Y., describes a line of back draft dampers to solve the noise problem in ventilating systems installed in schools and churches where noise is objectionable. These dampers are supplied in 58 standard sizes and the blades are non-metallic. .....**Item 89**

**BRONZE GLOBE VALVES**—A detailed circular No. 602-2 on the two pressure classes of Lunkenheimer LQ600 bronze globe valves, for a variety of services from normal to severe, is now being offered by the Lunkenheimer Co., Cincinnati, Ohio. This circular describes the original Fig. LQ600-150 valve, rated at 150 lb sp, 300 lb WOG, and the new Lunkenheimer Fig. LQ600-200 valve, rated at 200 lb sp, 550 deg F., 400 lb WOG. The circular lists features of each LQ600 pressure class, and describes the ASTM, ASME, and military specification numbers of the alloy used for the bodies and bonnets. .....**Item 90**

**FIBER PIPE FOLDER**—A revised L-M Permaline Fiber Pipe Folder, No. 54035, is presently being offered by Line Material Co., Milwaukee, Wis. It is available to plumbing wholesalers with the name of the wholesaler imprinted. The folder depicts applications and advantages of bituminized root-proof or perforated pipe. In addition, it contains installation information and lists available pipe sizes. .....**Item 91**

**BULLETIN ON LOCK SEAMING**—Bulletin 76-C, published by Niagara Machine & Tool Works, Buffalo, N. Y., describes a modernized universal power grooving machine. Details and specifications for the machine as well as for hand operated and larger power groovers are included along with step-by-step illustrations of single and Pittsburgh lock seaming. .....**Item 92**

**SMALL SIZE MOTOR**—The Redmond AL-4 FHP electric motor is described by the Redmond Co., Inc., Owosso, Mich., in a 4-page brochure. The motor comes in sizes from 1/75 to 1/15 hp. .....**Item 93**

**PLASTIC PIPE BULLETIN**—An 8-page illustrated bulletin on its line of high impact rigid Koroseal pipe, fittings and valves is published by The B. F. Goodrich Co., Plastic Products, Marietta, Ohio. The brochure explains how the pipe is installed, reviews product applications, and describes physical properties. The back page has a chart listing common chemicals handled by the pipe, fittings, and valves. .....**Item 94**

(*Continued on page* 149)

INSTALLING CONTRACTOR O. A. WENDT COMPANY, CHICAGO

**1300 FEET** of trench were needed, without special preparation or forms. Note simple concrete supports—no anchors are evident.

**EXPANSION LOOP** demands only additional GILSULATE on one side of each loop leg in the direction of expansion.

# Midwest manufacturer chooses GILSULATE® for plant expansion program

## New underground steam lines protected with Triple-Zone insulation system

When one of the world's largest manufacturers of heavy-duty engines expanded plant facilities, the company chose GILSULATE to insulate and protect their hot underground piping system. They knew that GILSULATE gives maximum insulation and corrosion protection against commonly-encountered underground conditions. And they knew too that GILSULATE's low cost for the *complete* installation could not be matched by any other underground pipe insulation.

This typical GILSULATE installation runs for 1300 feet from the plant's main boiler room to the new parts building. Included in the system are a 14-inch steam line, an 8-inch steam line, and a 6-inch condensate return. The line carries 150 pounds of steam pressure with superheat.

Your local GILSULATE distributor will be glad to show you all of the advantages of the modern, efficient GILSULATE Insulation System. Complete details are yours for the asking. Write the office nearest you today.

**GILSULATE IS POURED AND TAMPED** easily and quickly. Leap frog sheet metal forms conserve material; bulldozer handles backfill.

### Facts about Gilsulate

1. **EASY TO USE**—just pour and tamp... pipe heat does the rest.
2. **FORMS 3 ZONES** of protection against heat loss and all hazards commonly encountered by hot buried pipes.
3. **NEEDS NO HOUSING OR MECHANICAL SHEATHS:** no mixing, special handling or equipment.
4. **ONLY NEEDS NORMAL PIPE SPACING:** for multiple pipe or cramped conditions.
5. **THREE TYPES AVAILABLE:**
   Type A for 220°-300°F. temp. range
   Type B for 300°-385°F. temp. range
   Type C for 385°-520°F. temp. range

**THE TRIPLE-ZONE INSULATION SYSTEM FOR LIFE-TIME PROTECTION OF HOT UNDERGROUND PIPES**

GILSULATE®

AMERICAN GILSONITE COMPANY, SALT LAKE CITY 1, UTAH
Affiliate of Barber Oil Corp. & Standard Oil Co. of California

OFFICES AT: 134-A West Broadway, Salt Lake City, Utah
1145 East Jersey Street, Elizabeth 4, New Jersey
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## *Big duct, big saving with ULTRALITE* Insulation*

There's a big saving in heat loss (or heat gain) due to ULTRALITE's superior thermal efficiency. There's a big saving in application cost, too, because blanket rolls of ULTRALITE glass fiber insulation wrap quickly around ducts of every size and shape . . . and because ULTRALITE's long-fiber strength makes it easy to secure in place by methods not practical with ordinary glass fiber blankets.

Easy application and low applied cost are also highlights of ULTRALITE Duct Liner, an outstanding acoustical product specifically designed to silence duct noise. Both ULTRALITE Duct Insulation and Duct Liner are available through a nationwide network of distributors. **See adjoining column for name of your local distributor.**

**GUSTIN-BACON**

*Manufacturing Company* GUSTIN gb BACON

Molded glass fiber pipe insulation • Pipe couplings and fittings

**222 W. 10TH ST., KANSAS CITY, MO.**

*Trademark Reg.

High velocity air conditioning ductwork on the Hilton Palmer House, Chicago
Insulation Contractor: Culberg Asbestos Co.

## G-B ULTRALITE DISTRIBUTORS

(See ad on facing page)

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**AMARILLO**, Ball Distributing & Engr. Co.
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Southern States Iron Roofing Co.
**BROOKLINE**, Mass., Homans-Kohler, Inc.
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**CHARLESTON**, W. Va., Baldwin Asbestos Products Co.
**CHARLESTON HEIGHTS**, S. C., Stafford Insulation Co.
**CHICAGO**, E. C. Carlson Co.
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**CLEVELAND**, The Miles Materials Co.
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**DALLAS**, Insulation Supply Co., Inc.
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Payne-Ladewig, Inc.
**DENVER**, Gene Wright Lumber Co.
**DETROIT**, Coon-DeVisser Co.
**EL PASO**, Insulation & Specialties Co.
**FARGO**, N. D., Smith, Inc.
**FT. SMITH**, Ark., Gunn Distributing Co.
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**FT. WORTH**, The Bracken Co.
**GREENSBORO**, N. C., Starr Davis Co., Inc.
**HOUSTON**, Precision Insulation Co.
**INDIANAPOLIS**, Central Supply Co.
**IRON MOUNTAIN**, Mich., Champion, Inc.
**JACKSON**, Miss., Machinery Sales & Service Co., Inc.
**JACKSONVILLE**, Fla., Ferber Sheet Metal Works, Inc.
**JOPLIN**, Mo., Joplin Cement Co.
**KANSAS CITY**, Kelley Asbestos Co.
**LITTLE ROCK**, Gunn Distributing Co.
**LOS ANGELES**, Western Fibrous Glass Products
Plant Insulation Co.
**LOUISVILLE**, General Insulation & Roofing Co.
**MADISON**, Wis., J. D. Wilson Co.
**MEMPHIS**, John A. Denie's Sons Co.
**MIAMI**, Southern States Iron Roofing Co.
**MILWAUKEE**, J. D. Wilson Co.
**NASHVILLE**, Southern States Iron Roofing Co.
**NEW HAVEN**, Conn., Insulation Supply Co.
**NEW ORLEANS**, Eagle Asbestos & Packing
**NEW YORK**, Eastern Steam Specialty Co.
**OKLAHOMA CITY**, Ball Distributing & Engineering Co.
**OMAHA**, Cardinal Supply & Mfg. Co.
**PHILADELPHIA**, John F. Scanlan, Inc.
**PITTSBURGH**, D. J. Kennedy Co.
**PHOENIX**, Ariz., Kircher Asbestos & Rubber Co.
**RALEIGH**, N. C., Southern States Iron Roofing Co.
**RICHMOND**, Va., Southern States Iron Roofing Co.
**ROCKFORD**, Ill., Mott Brothers Co.
**SALT LAKE CITY**, Bullough Asbestos Supply Co.
**SAN ANTONIO**, The Bracken Co.
**SAN DIEGO**, Western Fibrous Glass Products
**SAN FRANCISCO**, Western Fibrous Glass Products
**SAVANNAH**, Ga., Southern States Iron Roofing
**SCHENECTADY**, N. Y., Jon Tree Sales & Supply Co.
**SEATTLE**, Western Fibrous Glass Products
**ST. LOUIS**, A. G. Brauer Supply Co.
**ST. PAUL**, Asbestos Products, Inc.
**SYRACUSE**, N. Y., Industrial Supply Co.
**TAMPA**, Fla., Eagle Roofing & Art Metal Works, Inc.
**TALLAHASSEE**, Fla., Capital Refrigeration & Supply
**TULSA**, Okla., Ball Distributing & Engr. Co.
**WASHINGTON**, Walter E. Campbell Co., Inc.
**WICHITA**, General Metals, Inc.
**VANCOUVER**, B. C., Fleck Brothers Limited

GUSTIN-BACON gb

# NEW CATALOGS

(*Continued from page* 146)

Use the prepaid postcard on page 105 for securing your copies of catalogs described in this department.

**FURNACE AND OVEN CONTROLS**—Available from Minneapolis-Honeywell Regulator Co., Industrial Div., Philadelphia, Pa., is a condensed bulletin and price list B43-1 which covers controllers, thermocouples, radiation detectors, remote bulb thermometer controllers, flame failure safeguards, limit controls, electronic and pneumatic valves. It introduces the new electronic special Class 14 line of strip chart, circular chart and circular scale instruments. .....**Item 95**

**POWER PIPE PUSHER** — How a power pipe pusher may be utilized in forcing pipe across streets and other rights of way without interfering with traffic is described in a booklet issued by the Mercury Hydraulics, Inc., Denver, Colo. Application instructions are illustrated in the booklet. .....**Item 96**

**SUBMERSIBLE PUMP BULLETIN** — A 6-page bulletin, No. 6710-20-A, gives revised ratings and sizes and new performance curves on submersible turbine pumps made by The Deming Co., Salem, Ohio, for wells from 4 to 6 in. in diameter. The bulletin also includes performance curves indicating peak efficiency, construction features and installation details and accessories. .....**Item 97**

**DUCT INSULATION DATA**—Engineering data and application instructions for semi-rigid, spun mineral wool duct insulation are available from Baldwin-Hill Co., Trenton, N. J. The bulletin provides illustrated instructions for applying the spun mineral wool duct insulation. .....**Item 98**

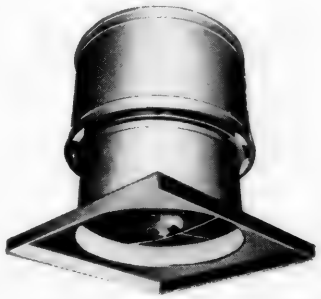
**PRESSURE TUBING** — Pressure tubing, designed for safe service at pressures up to 100,000 psi is described in data memorandum No. 22 published by Superior Tube Co., Norristown, Pa. Tubing is furnished in ten standard sizes from ⅛ to ¾ in., OD in increments of 1/16 in. A table lists the maximum wall thickness for each size and gives the minimum bursting pressure for single wall tubing in each OD size and wall thickness. Also included are seven formulas most generally used or cited for determining the stresses set up in the walls of a tube by the pressure of fluids within the tube. The final section describes hydrostatic and boroscopic tests. .....**Item 99**

**INDUSTRIAL COOLING TOWERS**—An 8-page catalog on the MTI line of industrial cooling towers is offered by Baltimore Aircoil Co., Inc., Baltimore, Md. The catalog describes in detail the 44 sizes available, and gives complete selection data in simplified form. .....**Item 100**

**EVAPORATIVE CONDENSER**—A bulletin has been issued by Drayer-Hanson Div. National-U. S. Radiator Corp., Los Angeles, Calif., to describe the PermaFan evaporative condenser. Unit comes in sizes from 5 to 110 tons. .....**Item 101**


FOR *Fast*

**DISCHARGE of AIR at HIGH VELOCITY**



*allen*

**VERTICAL DISCHARGE FAN**

• ***Keeps fumes from leaking back through building openings***

Whenever you face the problem of discharging fumes through a roof so that they will not short-circuit back through building openings, you'll find the solution in this Vertical Discharge Fan. It is designed especially for industrial applications that require the removal of a large volume at high velocity. It is fabricated of zinc-coated iron sheet with welded construction throughout. Automatic wing dampers open with air blast, close weather-tight when not operating. Available as "VD" direct drive with motor mounted inside air stream or as "VDR" with motor mounted outside throat of ventilator—both in a wide range of capacities and sizes.

*See Sweet's Architectural File, Section 20b or write for catalog.*

ALLEN ENGINEERED VENTILATION

ALLEN COOLER & VENTILATOR INC.
ROCHESTER, MICH.

*Roof Ventilators for Every Industrial Need*

***FILL OUT AND SEND COUPON***

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ROCHESTER, MICHIGAN

Please send me informative literature on your complete line of roof ventilators.

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Name _____
Position _____
Address _____
City, State _____

# NEWS OF THE MONTH

## ROOM COOLER RATINGS

**are considered damaging to the sale of central systems. Input ratings are criticized. Uniformity sought.**

At a meeting of distributors and dealers in New York City recently, Bruce D. Henderson, vice president of the Westinghouse Air Conditioning Division, stated that horsepower ratings, used for some time by manufacturers of room coolers, fail to give an accurate measure of the cooling capacity of air-cooled, central-type air conditioners. As a result, customers are getting an entirely false idea of the cost of central cooling. This is a direct result of the common industry habit of using the terms "compressor horsepower" and "ton of cooling capacity" interchangeably, Mr. Henderson said. In air-cooled units nothing could be further from the truth.

• **AIR-COOLED RATINGS SCORED**—"A homeowner attempting to select one of five major air-cooled home air conditioners," Mr. Henderson continued, "each claimed far and wide to be a 3-hp model, would find that the actual cooling capacities ranged from 25,000 to 37,000 Btu per hr—a variation of a full ton in cooling capacity of the unit.

"When the industry as a whole was concentrating on water-cooled models, one horsepower was generally equivalent to one ton of cooling capacity. Now, with the overwhelming rush to air-cooled models, the two terms are no longer interchangeable.

"When a manufacturer converts a properly rated water-cooled air conditioner to one using an air-cooled condenser, there is much more involved than merely replacing the condenser. For example, a water-cooled unit can operate at 120 psig condensing pressure and produce 36,000 Btu per hr. But when this is converted to an air-cooled unit and the condensing pressure is increased to 200 psig, the air conditioner will no longer produce 36,000 Btu per hr, but may drop to as low as 25,000 Btu per hr. To compensate for this drop in capacity, the compressor size must be increased.

• **INADEQUATE TESTING FACILITIES**—"One of the greatest deterrents to accurate and honest rating of air conditioners is the scarcity of proper testing facilities within the industry. In order to properly classify a unit, it is necessary to have test chambers in which controlled temperature, humidity and air-flow conditions can be maintained on both sides of the unit simultaneously. Only in this way can actual operating characteristics be determined."

• **UNIFORM RATINGS URGED**—Mr. Henderson emphatically urged that representatives of the air-conditioning industry join forces to establish and enforce the proper rating of their products. He said a certification system should be worked out similar to the American Gas Association rating in that industry. One of the foremost leaders in the creation of such a system is George S. Jones, Managing Director of the Air Conditioning and Refrigeration Institute in Washington, D. C. Leading manufacturers of air conditioning equipment are equally in favor of a uniform certification system, according to Mr. Henderson.

"Horsepower," Mr. Henderson concluded, "is a term used to measure the amount of power required to drive the compressor of an air conditioner. A ton of cooling capacity, on the other hand, is a measure of the amount of heat that can be removed in a specific period of time.

"When we talk about cooling capacity—then we hit what the customer is purchasing. The homeowner wants cooling, not horsepower. If we want his business, it's time to tell him exactly what he's getting for his dollar."

## IMPORTANT STUDIES

**to be made by Air Moving and Conditioning Association; tests planned on scale models.**

G. E. Szekely, general manager of the Bayley Blower Company, Milwaukee, Wis., and recently named national committee chairman of the Air Moving and Conditioning Association's (AMCA) Standards Committee, has revealed that his committee has undertaken several projects of importance to all industry.

• **FAN TESTS**—"Our major current assignment has to do with testing prototypes of fans in scale model sizes," said Mr. Szekely. "Building and testing full scale models of large equipment is frequently too expensive and impractical. We propose to use a technique similar to that of the aircraft manufacturers who test scale model equipment in miniature wind tunnels. We will be able to furnish specifiers with accurate performance data on extremely large size fans, determined by scale model tests.

"The Air Moving and Conditioning Association was formed early this year from the merger of three predecessor associations. We are proposing to adopt certain standards of the former organizations and revise others to serve the best interests of industry."

Work is also being done to improve integration of the product scope of the various product divisions which comprise AMCA. These product divisions include manufacturers of: Central station air conditioning units; centrifugal fans; industrial axial or propeller fans; power roof ventilators; residential fans; and unit heaters.

A report on the Standards Committee's projects will be presented at the annual meeting of the Air Moving and Conditioning Association at the Greenbrier, White Sulphur Springs, W. Va.

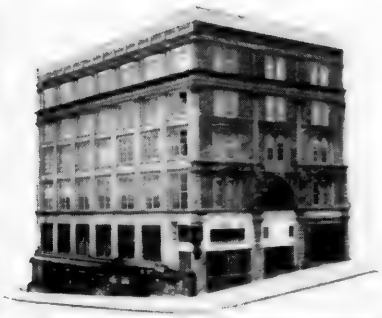
• **STANDARDS COMMITTEE**—Members of this committee are: E. C. Englert, Hartzell Propeller Fan Co.; R. A. Wasson, Clarage Fan Co.; W. H. Holt, Buffalo Forge Co.; J. F. Snow, Davidson Fan Co.; and J. I. Woodworth, Fedders-Quigan Corp.

• **ENGINEERING COMMITTEE**—The Engineering Committee consists of W. A. Curtis, manager of the Fan and Blower Division, Peerless Electric Co., chairman, and the following members: H. R. Bohanon, Acme Equipment

(*Continued on page* 152)

*Tenants are happy...*

# a thermostat in every room



*Owners are happy..*

# steam costs cut 49.5%

***A new kind of central heating with individual room control***

THE EVERETT BUILDING (shown above) is Akron's oldest office building, dating from 1870. Previously it was heated by a low pressure steam radiator system. In January, 1955, an Iron Fireman SelecTemp heating system was installed, substituting small, compact room heating units for the bulky steam radiators. Each room now receives filtered and circulated warm air, heated by steam, with *a thermostat in every room.*

### *Tenants control temperature of each office*

The results, in tenant comfort and steam savings, have been spectacular. One tenant, (Mr. James F. Mumper, Consulting Heating Engineer) says: "We have experienced sub-zero temperature with high winds. Our office has been held at an ideal temperature, with almost no variation up or down. It is so comfortable one never thinks of temperature. We now consider this SelecTemp system the most marvelous and satisfactory heating installation we have ever seen, and expect to specify it in many of our own jobs."

Another tenant, a physician, found in SelecTemp heating the ideal solution to an old problem. His examination room can be held constantly at a higher-than-average temperature, for the comfort of his patients, while his waiting room and offices remain at 72 degrees.

The Ohio Edison Company, which supplies steam to the Everett Building, made a detailed degree-day study of the building's steam consumption, covering a period of 12 heating months. This study showed a steam saving of 49.5% after the SelecTemp system was installed.

### *SelecTemp is new solution to old heating problems*

Any experienced architect or builder can readily visualize the enormous possibilities of SelecTemp heating in such buildings as hospitals, hotels and motels, schools, office buildings, apartment houses, institutions and buildings of any type, both for new construction and modernization. It will pay you to get the facts now about this revolutionary modern development in heating. The coupon below will bring full information.

**IRON FIREMAN®**

*Finest in heating and cooling*

**OIL • GAS • COAL**

IRON FIREMAN MANUFACTURING CO.
3039 W. 106th Street, Cleveland 11, Ohio.
In Canada, write to 80 Ward Street, Toronto, Ontario.
Send literature on Iron Fireman SelecTemp heating.

Name _____

Address _____

City _____ State _____

## IMPORTANT STUDIES

(*Continued from page* 150)

Co.; C. O. Fury, Clarage Fan Co.; A. F. Hubbard, American Air Filter Co., Inc.; R. E. Parker, Ilg Electric Ventilating Co.; T. A. Walters, American Blower Corp.

This committee is working on four projects important to the industry and to the ultimate user. They are:

Revision of the existing code for testing air moving equipment which will contribute to a uniform, accurate determination of performance ratings.

Development of accurate Pitot tubes of smaller size.

Standards for power roof ventilator base sizes to simplify installation and replacement.

Preparation of fans which require protective coatings.

Headquarters for the fifty-one member association are at 2159 Guardian Building, Detroit 26, Mich. Executive vice president is L. O. Monroe; assistant to executive vice president is Robert E. O'Rourke.

## HOTEL HEATING PLANT

**is revamped to increase its efficiency and output. Design is based upon past performance records.**

A 10% savings in operating efficiency was reported by Chief Engineer Glen C. House of Chicago's Hotel Sherman as a result of new boiler and burner equipment.

Until recently, the hotel had four water-tube boilers. Three were equipped with rotary cup oil burners and multiple jet gas burners. The fourth was stoker fired and was installed for emergency use in the event that oil or gas should not be available, or in case of a breakdown of any of the other three boilers.

Early in 1954, the hotel was obliged to replace one of the old boilers and decided to convert the coal fired boiler to oil and gas, thereby enabling them to operate on any two boilers with oil or gas.

• **HOTEL'S REQUIREMENTS**—When the need for a new boiler arose, Mr. House determined the basic requirements of the hotel from records which have been kept since 1941. These data, recorded by month and year, included such information as pounds of coal, gallons of fuel oil, therms of gas, pounds of steam produced, and degree-day records.

These figures were transposed onto a graph on which peak load periods were pin-pointed. Daily flow charts for corresponding periods were reviewed carefully and an analysis made of peak loads by day of the year as well as hour of the day. Knowing the hotel's load, as well as the demand by other properties purchasing steam, it was established that an 80,000 lb per hr maximum demand existed. The two existing boilers were capable of producing 92,000 lb per hr combined, but, allowing for future increase in demand, it was decided to install a boiler of approximately 55,000 lb per hr capacity. Consequently, by operating the new boiler with either existing boiler, the hotel has a maximum capacity of 100,000 lb per hr. Approximately two thirds of the minimum boiler capacity is reserved for the hotel's own requirements; the other third is available for adjoining properties who may purchase the steam.

• **INSTALLATION**—Information required for the selection of equipment was turned over to Enterprise Heat and Power Co. of Chicago who engineered and installed oil and gas burners with combustion controls and instruments for maintaining proper air-fuel ratios. The burners are of the forced draft type, and the boilers operate under negative pressure, relying on natural draft.

The new boiler, installed by Lasker Boiler and Engineering Co., was put on the line in October, 1954. The conversion of the coal fired boiler to gas and oil was completed about one month later. The two boilers have been used singly or in battery to carry the entire load almost exclusively. In one year of operation, the efficiency with the new equipment has increased about 10%. Since the hotel sells steam to adjoining properties, the total load is in excess of 200,000,000 lb of steam per year.

• **EFFICIENCY CHECKED**—A unique system is employed by the chief engineer to maintain a high standard of performance. Each of his engineers must submit a daily report on fuel consumption and steam production for his eight hour shift. The result, as expressed in operating efficiency, is posted on a blackboard. The man with the poorest results for the day is obliged to have his record posted in red. Since no change was made in manpower and with corrections being made for variations in fuel costs and degree days, the claimed increase in efficiency is almost all attributed to the boiler, burner, and combustion control design.

## NEW ENGINEERING STANDARD

**for air conditioning multi-zone buildings and other structures sets conditions and factors for designing.**

A new application engineering standard for air-conditioning multi-zone buildings, such as factories, office buildings, and similar structures in which varying degrees of cooling and humidity must be mantained, has been issued by the Air-Conditioning and Refrigeration Institute. It is limited to the setting of minimum conditions and factors that form the basis of design load estimating and specifications of performance for such installations.

• **REVISES OLD STANDARD**— In effect a complete revision of a standard issued in 1947 by the Air Conditioning and Refrigerating Machinery Association, a predecessor organization of ARI, the new document is designated as ARI Standard 530. It represents fulfillment of a long-sought industry desire to systematize application engineering of air-conditioning installations. To commercial and industrial building owners, consulting engineers, and architects, who contemplate air-conditioning for themselves or their clients, the new standard will provide a working tool of value, it was pointed out by ARI.

• **FACTORS COVERED**— Among the factors and phases of estimating loads and setting performance specifications covered in the new ARI Standard 530 are:

1) Design load factors for inside and outside conditions, 2) Sensible heat gain through glass, 3) Transmission, 4) Heat gain from occupants, 5) Heat gain

(*Continued on page* 154)

# 427 miles of heating dependability

## ASSURED FOR N.Y. STATE THRUWAY!

**FIRST... By Sarcotherm Weather-Compensated Control Systems for all 40 Toll Interchanges**

**AND NOW... By Sarco Heating Specialties for 23 Service Areas**

ON THE NEW YORK STATE THRUWAY, there are now 23 restaurant-gas service areas and 40 toll interchanges along the 427 miles of this great vehicular artery... from New York to Buffalo.

Each of these service areas and toll interchanges has its own heating plant. Therefore, dependability of equipment is of vital importance... for faulty operation or breakdowns would mean heating headaches and call-backs all along 427 miles of highway.

That is one of the principal reasons for the installation of Sarcotherm Weather-Compensated Control Systems for the hot water heating of *all* 40 toll interchanges... and of Sarco Steam Heating Specialties for *all* the 23 service areas now completed.

**For undivided responsibility** on your installations, specify and order from one "Complete Line" source... SARCO-SARCOTHERM... heating specialties, temperature regulators, condensate and vacuum pumps, finned tube radiation, and weather-compensated control systems for steam and hot water heating. Write for catalogs.



**SERVICE AREAS**—Architect: Eggers and Higgins. Consulting Engineers: Jaros, Baum & Bolles. Heating Contractors: Joseph Davis, Inc.; Mechanical Installations, Inc.; Harry Hoyle Contracting Co.



**TOLL INTERCHANGES**—Mechanical Engineers: Syska & Hennessy, Inc. Heating Contractor: Mechanical Installations, Inc.

**SARCOTHERM**

**Sarcotherm Controls, Inc. • Sarco Company, Inc.**
**Empire State Bldg., N. Y. C.**

4008-B

## NEW ENGINEERING STANDARD

(*Continued from page* 152)

from appliances, 6) Ventilation and infiltration, 7) Air motion in conditioned spaces, 8) Capacity specifications, 9) Cooling load calculations, 10) Multi-zone building refrigeration loads, 11) Heating load calculations and 12) Safety provisions.

• **NEW STANDARD MORE COMPREHENSIVE**—The standard includes a new and more comprehensive cooling load estimate form. A major addition is the inclusion of factors and instructions for calculating the total refrigerating load in multi-zone buildings.

Copies of ARI Standard 530 may be obtained from the Air-Conditioning and Refrigeration Institute, 1346 Connecticut Avenue, N. W., Washington 6, D. C.

## WATER TANK STANDARD

**will be studied for revision by porcelain enameled tank industry. Suitable test methods are sought.**

Revision of the commercial standard for porcelain enameled hot water tanks was the subject of a meeting, held recently at the Mayflower Hotel in Washington, D. C. Sponsored by the Porcelain Enamel Institute, the conference was attended by representatives from manufacturers of porcelain enameled hot water tanks, basic suppliers to the industry, and the Federal Government.

• **PUBLISHED IN 1944**—John C. Oliver, managing director of the Institute, pointed out that Commercial Standard CS115-44 is no longer applicable to present industrial operations. He stated that the standard was first published in 1944 and is still being referred to in Government specifications and by industry. "It now needs to be brought up to date," he said.

The election of officers of the Over-all Study Committee and chairmen of three sub-committees was the first order of business. Dr. G. H. Spencer-Strong, of Pemco Corp., was elected chairman of the Over-all Committee and J. C. Richmond, Enameled Metals Section, National Bureau of Standards, was elected secretary. The three sub-committees, established for the purpose of recommending technical revision of the standard, and their chairmen are as follows: Enamel Thickness, Coverage and Magnesium Anode, chairmanned by F. W. Nelson; Chemical Tests, chairmanned by R. H. Gieser; and Mechanical and Physical Tests, chairmanned by J. C. Berry.

• **SEEK TEST METHODS**—An important objective of the group during the period ahead is the development of suitable methods for testing the solubility of enamel, enamel coverage and thickness, and specular gloss that will correlate satisfactorily with actual field data.

Following a discussion of the general requirements for the standard, the individual sub-committees met and then submitted their preliminary reports with suggested technical changes in the specification. The sub-committees will do further investigations and will submit their final recommendations within six months.

In concluding the meeting, Mr. Oliver stated that the Porcelain Enamel Institute's interest in revision of Commercial Standard CS115-44 is that of a trade association desirous of seeing its industry's interests properly served. He pledged the Institute's fullest cooperation and help in any way that might serve the industry in connection with this work. Those representatives of the Government who were present also gave evidence of their various agencies' interest and stated that a revised commercial standard for water tanks will lend assurance to customer satisfaction and aid in the continuation of reliable sources of supply.

## HONEYWELL ELECTS

**K. L. Wilson vice president; he will continue head of Heating Controls Division.**

K. L. Wilson has been elected vice president of the Minneapolis-Honeywell Regulator Company. A graduate of the University of Minnesota, where he received an engineering degree, Mr. Wilson joined Honeywell in 1931 as a student engineer. He has held numerous sales and administrative posts since then.

He was formerly manager of the Residential Division, previously known as the Heating Controls Division. This division, which continues under Mr. Wilson's direction, has the responsibility for the sale and distribution of the heating and air conditioning controls the company produces for homes.

## PRODUCTS PARADE

**placed on tour by Warren Webster & Co.; meetings scheduled for 50 cities in 37 states.**

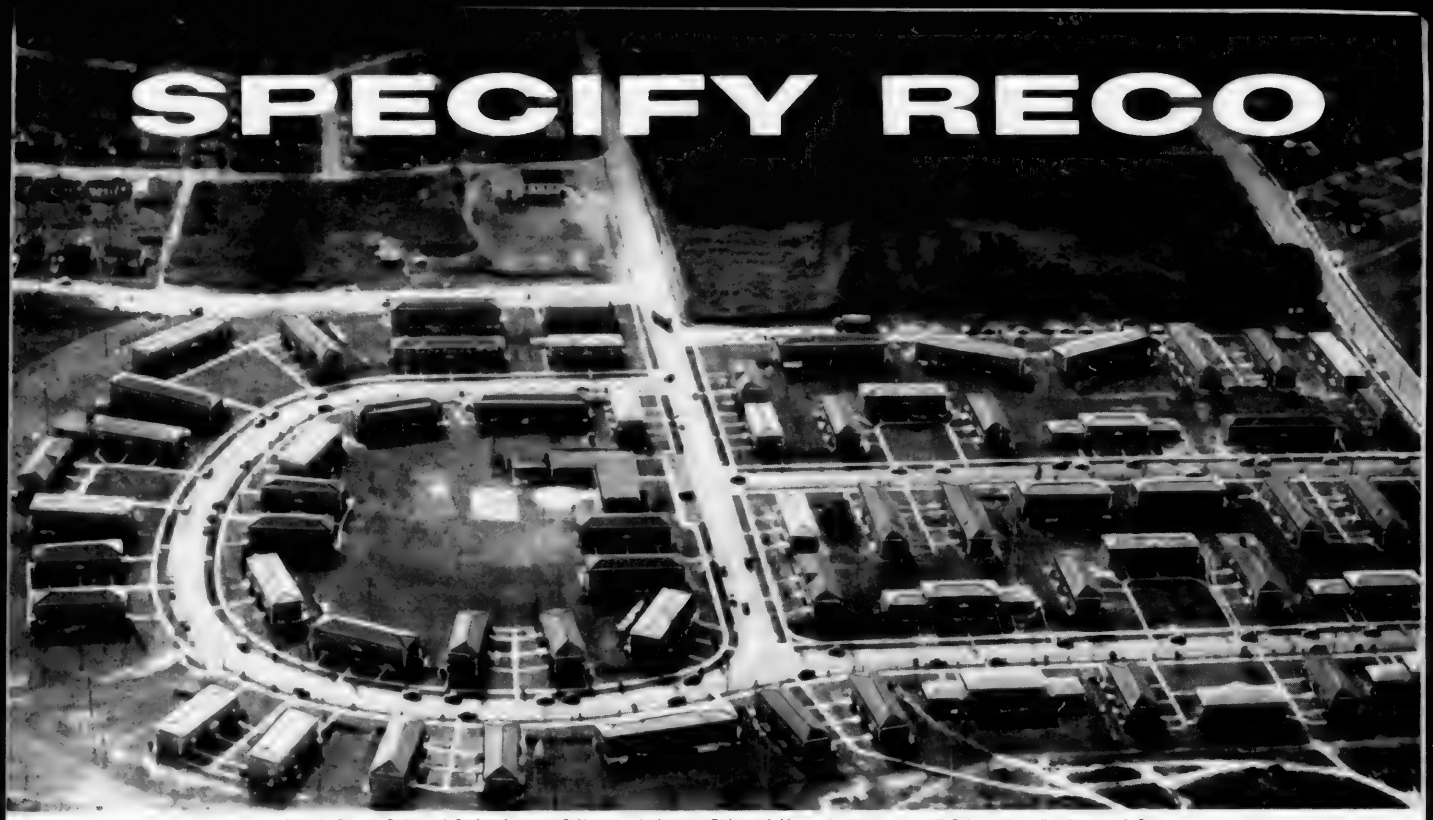
An educational presentation of new developments in heating and cooling equipment manufactured by Warren Webster & Company, Camden, N. J., is now on tour of 50 principal cities, in what is termed the Websterama products parade.

• **OBJECTIVE OF TOUR**—Launched in Philadelphia on September 11th, this presentation was planned for architects, engineers, heating contractors, and building owners and managers. The basic heating comfort advantages of

(*Continued on page* 156)

Inspecting products at one of the meetings.

# SPECIFY RECO



*Hillside Court*—Richmond Redevelopment & Housing Authority—Richmond, Va. *Architects*—Merrill C. Lee; Marcellus Wright & Son.
*Consulting Engineer*—W. A. Brown, Richmond, Va. *Mech. Contractor*—William H. Singleton Co., Inc., Arlington, Va.

## Award Winning Slum Clearance Project Picks RECO Hot Water Storage Heaters

THE FEDERAL PUBLIC HOUSING ADMINISTRATION and the American Society of Landscape Architects agreed. In a nationwide study of 1408 slum clearance housing projects, they cited Hillside Court in Richmond, Virginia, as "outstanding and noteworthy" in design and architectural achievement.

AND THE CONTRACTORS PICKED RECO Heat Exchange Equipment to supply plenty of hot water to the 402 dwellings of Hillside Court and the 504 units of its sister project, Creighton Court.

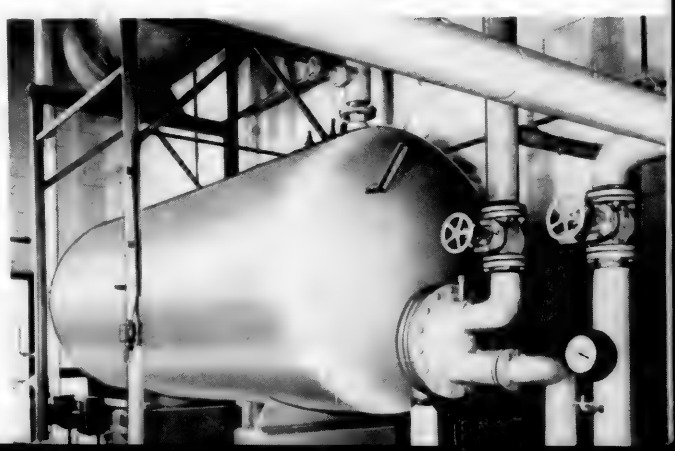
SIX RECO CEMENT-LINED HOT WATER STORAGE HEATERS and expansion tanks—three for each project—supply approximately 8300 gallons of pure, rust-free hot water per hour.

RECO HYDRAULIC CEMENT LINING IS JUST ONE of RECO'S many special corrosion-resistant coatings and linings. Your *own* water problem may call for one of the others such as tough, baked-on plastics, copper lining, copper silicon, clad steel or hot-dipped galvanizing. But whatever your need, let RECO help you solve it. Consultation is free from cost or obligation.

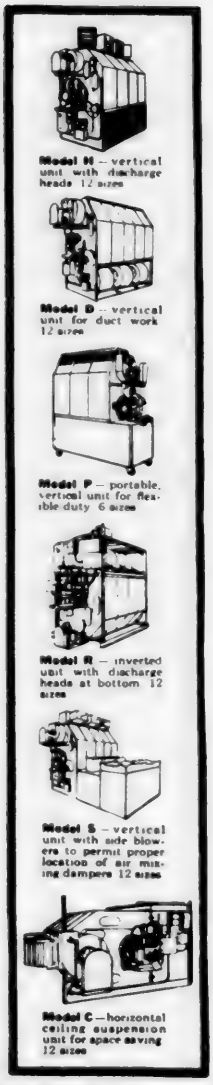
RECO'S COMPLETE LINE OF HEAT EXCHANGERS has an international reputation for outstanding performance, top quality, competitive prices and quick delivery. Rely on this reputation on your next heating job—SPECIFY RECO! Write today for free catalogs and the name of your nearest RECO representative.

## Richmond Engineering Co., Inc.

**Dept. J, 7th & Hospital Sts., Richmond 5, Virginia—Phone 7-2611**



# SEND TODAY FOR LATEST HEATER DATA



**Model H** — vertical unit with discharge heads 12 sizes

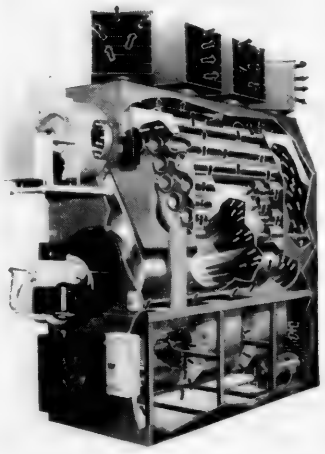
**Model D** — vertical unit for duct work 12 sizes

**Model P** — portable, vertical unit for flexible duty 6 sizes

**Model R** — inverted unit with discharge heads at bottom 12 sizes

**Model S** — vertical unit with side blowers to permit proper location of air mixing dampers 12 sizes

**Model C** — horizontal ceiling suspension unit for space saving 12 sizes



Tempering Make-up Air? Drying? Space Heating?

Let National Heater Company show you how space heating and ventilating problems can be solved **efficiently** and **economically.** No matter how large or small a plant may be, National Champion Heaters **save** money on installation, operation and maintenance.

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DIRECT FIRED HEATERS

6 Models 66 Sizes
400,000 to 2,000,000 BTU's
Automatic Operation
PLUS Year-Round VENTILATING!

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WRITE TODAY FOR A NEW 6-PAGE BROCHURE LISTING SPECIFICATIONS AND DIMENSIONAL DATA OF 1956-57 LINE OF NATIONAL CHAMPION HEATERS.

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ADDRESS:_____

BY:_____

POSITION:_____

NATIONAL HEATER CO., INC.
2180 Cleora Ave. St. Paul 4, Minn.




## PRODUCTS PARADE

(*Continued from page* 154)

Webster Tru-Perimeter Heating, together with the details of two new Webster heating-and-cooling systems, are the headline features of this traveling display.

Two-man teams from the Webster home office are presenting Websterama to meetings arranged by Webster representatives in the field. Following its Philadelphia opening, the Websterama products parade moved to New York City. The itinerary includes cities in 37 states this fall and winter.

## GRADUATE DEGREES

**financed by Carrier Corp. for company engineers; 3½-year plan announced.**

A new post-graduate level engineering education program tailored specifically to meet the growing requirements of a complex technology has been announced by Cloud Wampler, chairman of the board of Carrier Corp. This plan will make it possible for many engineers employed by Carrier to obtain advanced degrees in mechanical engineering on a part-time basis without cost.

• **EXPENSES PAID**— Although industry in general is actively supporting educational institutions at the undergraduate levels, expanding that support to post-graduate training is a new, important trend. The Corporation will assume all the expenses for the 3½ year program for participating students.

Classes are conducted in the late afternoon by Syracuse University College. The 25 engineers who are engaged in research, development, and manufacturing activities for the company have met the regular University Graduate School admission requirements and must continue to maintain satisfactory academic standards.

• **OTHER SUPPORT**— The Carrier Foundation each year provides full-term engineering scholarships in four selected universities, open to all qualified high school graduates, with selections being made by the schools involved. On-the-job engineering training programs include 48 weeks of rotational work assignments, formal orientation courses and 96 hours of engineering seminars. Further expansion of academic training for technical personnel is in the planning stage.

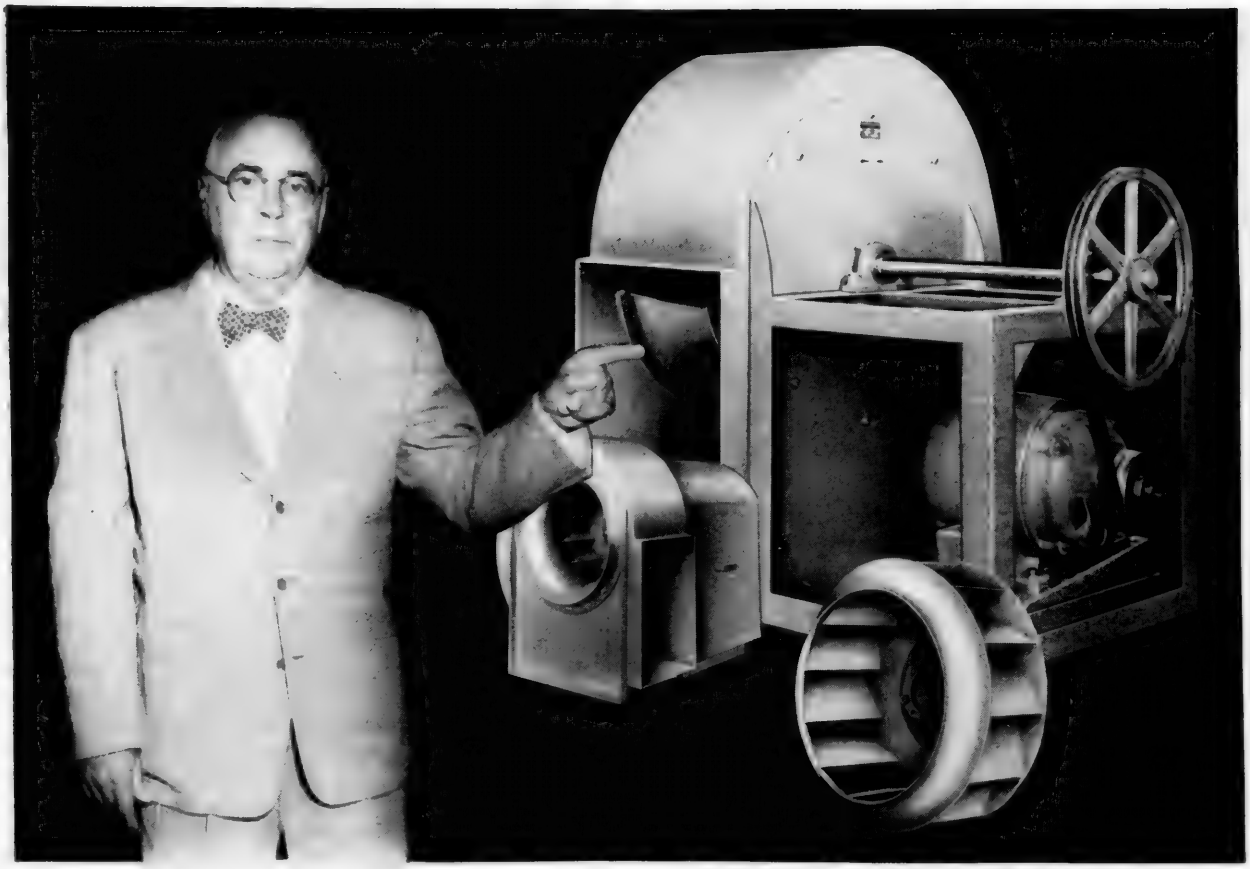
## AIR CONDITIONING GROUPS

**seek method for testing and rating equipment. Committee organized to evaluate standards for industry.**

Two industry trade associations—the National Warm Air Heating and Air Conditioning Association and the Air Conditioning and Refrigeration Institute—have joined hands in an effort to establish an industry-accepted procedure for testing and rating central air conditioning units.

Preliminary exploration of the project was accomplished in a meeting held in Washington and attended by

(*Continued on page* 158)



RALPH KROEHLE, PRESIDENT THE PEERLESS ELECTRIC COMPANY

# "...THE BEST BLOWER ENGINEERING..."

● Peerless engineers work under orders to give every fan and blower "the best possible engineering." Our engineering standards now meet or exceed all industry codes. The reason is simple.

**COMPLETE ENGINEERING**—Peerless builds its own motors and job matches them to meet blower requirements. They have the advantage of being one complete unit, tested thoroughly for motor characteristics, speed and drive alignment.

**HEAVY CONSTRUCTION**—Peerless frames and housings are better and of heavier construction than any competitive products. Construction is all-welded. The result is a vibration-free unit.

**NAFM APPROVED**—Peerless Backward Curve Belt Drive Utility Blowers in sizes from 12½" to 36½" meet all NAFM recommendations. They have self-limiting horsepower characteristics and dynamically balanced wheels with matched spun cones. There is nothing in the air stream. Operation is exceptionally quiet.

**PERFORMANCE DATA**—Complete data on Peerless fans and blowers is cataloged for easy reference. Bulletin SDA-160 shows all fans and forward curve blowers. Bulletin SDA-200 gives all data on backward curve blowers (NAFM) from 12½" to 36½". Use the coupon below to get your file copy. Dimension prints are available on request.

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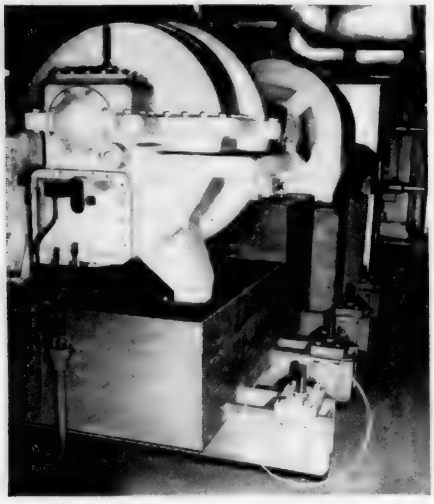
## In this "Drive-In" Office Building

# KORFUND VIBRATION CONTROL *allows more rentable space*

***A feature of the Cafritz Building in Washington, D. C., makes it possible to drive your car up a series of ramps, and park it outside your office door.***



The Cafritz Building, Washington, D. C.
LeRoy L. Weiner *Architect*
William A. Brown *Consulting Engineer*
Cafritz Construction Company *Builder*
Mehring & Hanson Company *Mechanical Contractors*

Another feature is this 530 Ton Centrifugal Refrigeration Machine installed on the roof. Korfund Steel Spring Vibro-Isolators with adjustable leveling bolts (a Korfund feature for over 30 years) made this installation possible, since they completely prevent vibration and noise transmission even to floors directly below. This makes available more revenue-producing space elsewhere in the building.

This is just one of hundreds of successful upper floor installations of heavy air conditioning equipment on Korfund spring isolators. Only Korfund Vibro-Isolators allow really heavy upper floor installations without floor reinforcement and with positive assurance of vibration and noise control.

Utilize all possible revenue-producing space — move air conditioning equipment upstairs. Korfund experience makes it possible. There is no substitute for experience.

For more information, write for your copy of Bulletin 23, or see our catalog in Sweet's Files.

For specific recommendations, contact us or your local Korfund Office. Look under "Korfund" in your local Telephone Directory or Thomas' Register. A half-century of experience is at your disposal.

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## AIR CONDITIONING GROUPS

(*Continued from page* 156)

representatives of both associations, according to a report issued by the National Warm Air Heating and Air Conditioning Association.

• **COMMITTEE IS ORGANIZED**—A special joint committee, consisting of three representatives from each association, was organized. Richard J. Dill, of the National Bureau of Standards, was selected to serve as committee chairman.

Committee members are: K. T. Davis, of Carrier Corp.; R. A. Gonzalez, of Airtemp Div., Chrysler Corp.; Graydon Peoples, of Lennox Industries, Inc.; J. A. Gilbreath, of the air conditioning division of Westinghouse Electric Corp.; A. F. Ward, of Worthington Corp.; and J. O. Yund, of Servel, Inc.

• **TO EVALUATE STANDARDS**—The committee has been assigned the task of evaluating the standards which are now available for testing and rating air conditioning equipment that can be connected to ducted distribution systems and that are supplied as either packaged or matched components for field assemblies. The committee will also prepare recommendations covering changes or adoptions of these standards together with recommended procedures of compliance. The final results of the committee's efforts will be submitted to members of the industry for approval and acceptance.

## SUBWAY CAR

**air conditioned by system that operates through automatic temperature control**

The most flexible air conditioning system ever developed for subway cars has been installed on a Hudson and Manhattan rapid transit unit. The subway line operates between New York City and New Jersey.

• **CAR DESIGNING**—A product of close cooperation between the Pullman-Standard Car Manufacturing Company and The Trane Company, La Crosse, Wis., the system is designed to provide cool comfort for the entire day—from rush hours to slack periods.

In accordance with a system invented by Pullman-Standard, Trane engineered and designed an overhead cooling unit and an undercar compressor-condenser set which provides maximum efficiency with the least noise. The system was thoroughly tested at the Trane Research Laboratory.

• **OPERATION**—The completely automatic, thermostatically-controlled system swings into operation when the car temperature rises above 76 deg F with recirculating air fan speeds gradually increasing to peak performance at 82 deg.

Outside air at 1500 cfm is drawn through exterior car frame louvers, filtered, dehumidified and cooled to a predetermined temperature.

Moisture control is particularly vital to the successful operation of subway air conditioning and the system was specifically designed to meet this challenge. Tests showed the humidity is controlled at comfortable levels even when the car is packed with people.

*Leak-free joints made easily with torch and solder.*

*Section of system ready for paving.*

## Milwaukee Gas Light Company

# MAKES SNOW GO

## with Chase Copper Water Tube!

Blizzard snows and freezing rain don't stand a chance around 626 East Wisconsin, in Milwaukee! The Milwaukee Gas Light Company's sidewalks are always free of snow and ice—thanks to an efficient snow removal system of Chase copper tube!

The contractor, John S. Jung, used both Chase Type L copper tube and Chase copper solder-joint fittings in the installation. This combination is unsurpassed for easy, fast installation plus trouble-free performance over the years! You see, corrosion-resistant Chase copper tube comes in long lengths that are easily bent into position and require fewer joints. Tube and fittings are *made for each other,* so leakproof solder-joints are assured. They expand and contract *as one unit* with temperature changes!

*Snow everywhere . . . but not around Milwaukee Gas Light Co. building!*

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# BOOK REVIEWS

*Publications abstracted in this department should be ordered direct from publisher.*

## ELECTRICAL TESTING AND TROUBLESHOOTING

A variety of methods for testing and correcting faults in electrical circuits of all kinds, including controllers, motors, transformers and transmission lines, is covered in Electrical Testing and Troubleshooting by Philip T. Green. The author is industrial training coordinator, Panama Canal Zone Company and educational advisor to units of the International Brotherhood of Electrical Workers. Each of the troubleshooting procedures has been proven in the field to be a great time saver, particularly for locating obscure sources of trouble. The text presentation has also been tried out in classroom work.

Through the use of convenient step-by-step methods, information is presented that has been used by men in the field responsible for installation and maintenance of electrical equipment.

A basic knowledge of simple arithmetic is sufficient background for understanding the text and for using the procedures described. After a simple briefing on how to understand electrical symbols and drawings, the subjects presented include: Analyzing and charting controller operation; troubleshooting test equipment; insulation testing; locating grounds; electromagnet windings; d-c machine windings; single phase transformers; phase sequence; polyphase transformers; induction motors; synchronous motors; power cable faults and bearing lubrication. Each subject includes adequate reference to applicable codes and standards.

Ideas presented in Chapter 2 are especially useful where outage of a complicated controller is serious enough to warrant charting information in advance of an outage.

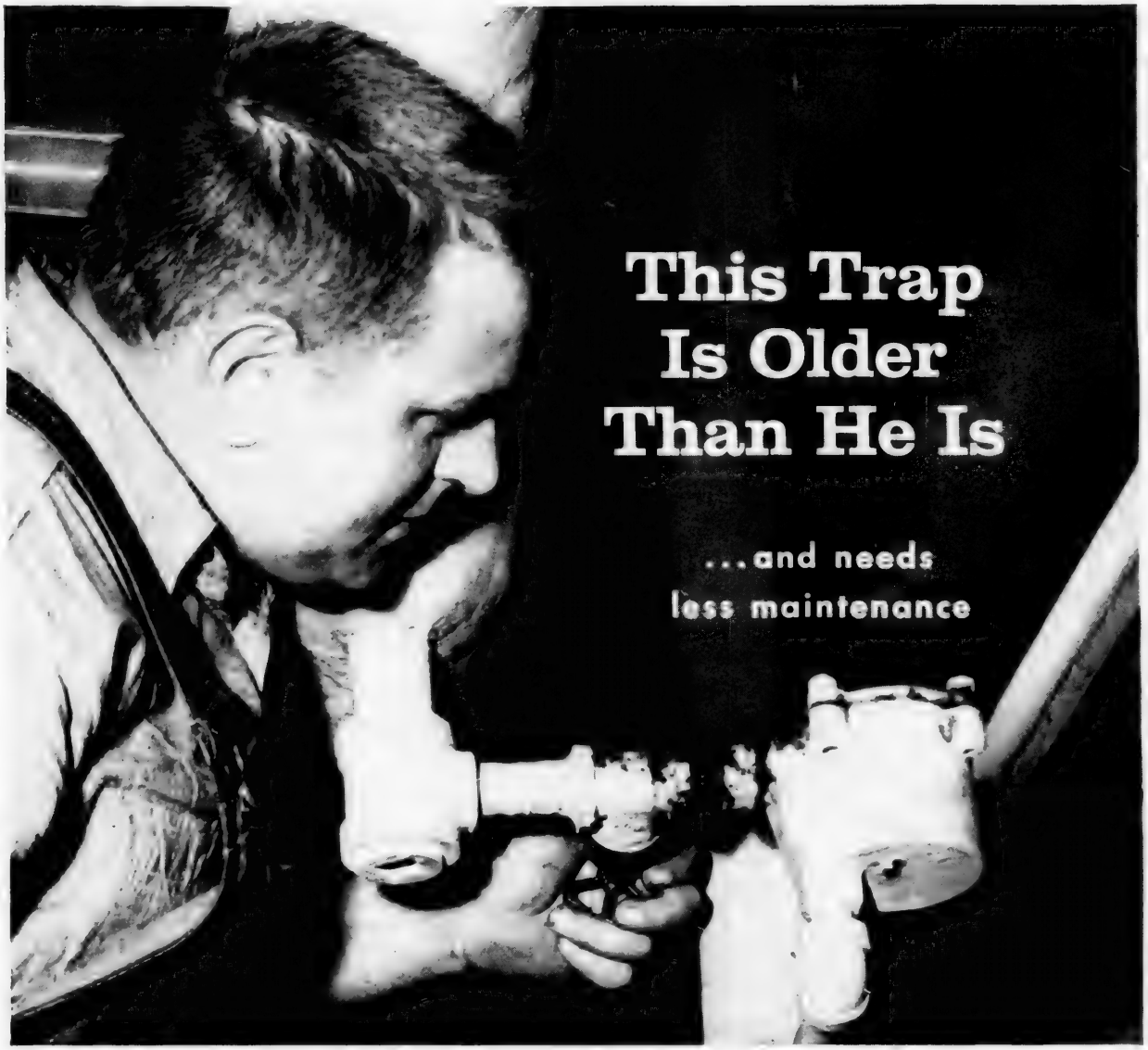
An important feature of the tests described is that they are performed with the equipment isolated from the power line. Current for testing is supplied by dry cells or residual magnetism so that accidental contact or short circuits are less hazardous to men and machines.

This book should prove a useful guide for practicing electricians and a basic text for those in training.

*Electrical Testing and Troubleshooting, by P. T. Green. Cloth bound, 6 x 9 inches, 200 pages. Published by The Industrial Press, 93 Worth St., New York 13, N. Y. Price, $4.*

• • •

COMBUSTION IN SMALL DIAMETER TUBES—AGA Research Report No. 1255 presents combustion and heat transfer data resulting from the elongation of gas flames in 1½-inch diameter tubes. Experiments were performed in which gas flames were elongated over a distance of several feet inside straight 1½-inch tubes. Burners were developed for applying heat input rates as high as 60,700 and 72,000 Btu per hr per sq in. of tube internal cross section area with the tubes immersed in still air and running water, respectively. Theories of heat transfer applicable to these small tubes are interpreted as an aid to designers. American Gas Association, 420 Lexington Ave., New York 17, N. Y. Price, $1.




Operating Engineer Claude Rogers is inspecting an old trap that was installed in the LaSalle Hotel, Chicago, in 1909—before he was born! That's 47 years of service, and it's still operating. It's one of 62 old Illinois Engineering "Automatic Float-type Vacuum" traps still doing a job there.

Some of the traps were replaced in 1952, after 43 years of duty. But—mark this—*the LaSalle always replaces the original traps with new Illinois Float and Thermostatic Traps.* And the LaSalle's new heating-air conditioning system has *only Illinois* traps.

Reasons: More years of trouble-free service than you'd ever expect . . . No maintenance problems with Illinois' simple, solid design . . . probably the most efficient system of condensate drainage yet devised for heating systems . . . Straight-through connections to save head room and labor.

For real *durability* and efficiency in a Float and Thermostatic trap, take a hint from the LaSalle Hotel's 47-year-old Illinois installation and hundreds more like it. Specify Illinois Series G Float and Thermostatic traps for low and medium pressure steam jobs from 15 lbs. pressure to 25 inches vacuum. Series MG to 50 lbs. pressure. Available in sizes from ¾" to 2". Send for Bulletin 251 *now*.

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# COMING EVENTS

**Where listed, names or titles of individuals are those from whom further information is available**

**AGA CONVENTION**—Annual convention of the American Gas Association, at the Auditorium, Atlantic City, N. J. Secretary of the Association, 420 Lexington Ave., New York 17, N. Y. ..... **OCTOBER 15-17, 1956.**

**ANTHRACITE CONFERENCE**—An Anthracite Conference will be held at the Mineral Industries College of The Pennsylvania State University, University Park, Pa. P. L. Walker, Jr., Department of Fuel Technology of the University, University Park, Pa. ..... **OCTOBER 18-19, 1956.**

**ASA MEETING**—38th annual meeting of the American Standards Association, in conjunction with the Seventh National Conference on Standards, at Hotel Roosevelt, New York, N. Y. Secretary of the Association, 70 E. 45th St., New York 17, N. Y. . . **OCTOBER 22-24, 1956.**

**CORROSION ENGINEERS EXHIBITION**—Exhibition of corrosion control materials will be held concurrently with the south central regional meeting of the National Association of Corrosion Engineers, at the Gunter Hotel, San Antonio, Tex. A. B. Campbell, executive secretary of the Association, 1061 M & M Building, Houston 2, Tex. ..... **OCTOBER 23-26, 1956.**

**AIR-CONDITIONING WHOLESALERS MEETING**—Annual meeting of the Air-Conditioning and Refrigeration Wholesalers, at the Jung Hotel, New Orleans, La. Secretary, 2607 N. High St., Columbus, Ohio. ..... **OCTOBER 24-27, 1956.**

**REFRIGERATION ENGINEERS CONVENTION**—Annual convention of the Refrigeration Service Engineers Society, at Hotel Muehlbach, Kansas City, Mo. H. T. McDermott, International secretary of the Society, 433 No. Waller Ave., Chicago, Ill. ..... **NOVEMBER 15-18, 1956.**

**ASRE CONVENTION**—Semi-annual meeting of the American Society of Refrigerating Engineers, at Hotel Statler, Boston, Mass. Secretary of the Society, 234 Fifth Ave., New York 1, N. Y. ..... **NOVEMBER 25-28, 1956.**

**ASME MEETING**—Annual meeting of the American Society of Mechanical Engineers, Hotel Statler, New York, N. Y. Secretary of the Society, 29 W. 39th St., New York, N. Y. ..... **NOVEMBER 25-30, 1956.**

**REFRIGERATION CONTRACTORS CONVENTION**—Annual convention of the Refrigeration and Air Conditioning Contractors Association, at the Balmoral Hotel, Miami Beach, Fla. Secretary of the Association, 10660 Carnegie Ave., Cleveland 6, Ohio. ..... **NOVEMBER 26-28, 1956.**

**POWER SHOW**—The 22nd National Exposition of Power and Mechanical Engineering, under the auspices of the ASME, at the New York Coliseum, Columbus Circle, New York, N. Y. E. K. Stevens, International Exposition Co., 480 Lexington Ave., New York 17, N. Y. ..... **NOVEMBER 26-30, 1956.**

**CHEMICAL EXPOSITION**—9th National Chemical Exposition of the American Chemical Society, in the Cleveland Public Auditorium, Cleveland, Ohio. Secretary of the Chicago Section of the Society, 86 E. Randolph St., Chicago, Ill. ..... **NOVEMBER 27-30, 1956.**

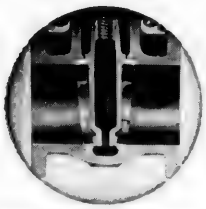
**WARM AIR HEATING CONVENTION**—Annual convention and committee meetings of the National Warm Air Heating and Air Conditioning Association, at the Netherland Plaza Hotel, Cincinnati, Ohio. George Boeddener, managing director of the Association, 145 Public Square, Cleveland 14, Ohio. .... **NOVEMBER 27-30, 1956.**

**AIR POLLUTION MEETING**—Semi-annual meeting of the Air Pollution Control Association, at the Rice Hotel, Houston, Tex. H. C. Ballman, executive secretary of the Association, 4400 Fifth Ave., Pittsburgh 13, Pa. ..... **DECEMBER 3-5, 1956.**

**SOLAR ENERGY SYMPOSIUM**—Two-day symposium on solar furnace design and operation, sponsored by the Association for Applied Solar Energy, in conjunction with Stanford Research Institute, Arizona State College and the University of Arizona, to be held at the Hotel Westward Ho, Phoenix, Ariz. J. I. Yellott, secretary of the Association, 3424 N. Central Ave., Phoenix, Ariz. ..... **JANUARY 21-22, 1957.**

**PLANT MAINTENANCE SHOW**—Eighth National Plant Maintenance and Engineering Show at the Public Auditorium, Cleveland, Ohio. Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y. ..... **JANUARY 28-31, 1957.**

(*Continued on page* 164)



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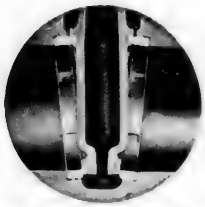
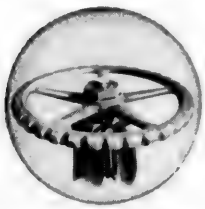


**Seat Rings** of end-seated type are screwed into the body.



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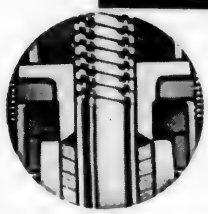

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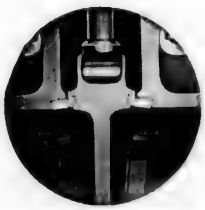

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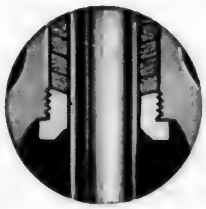

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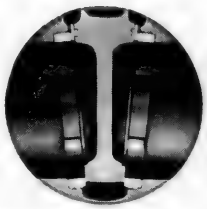

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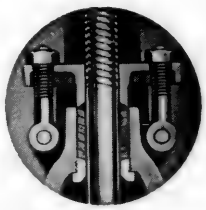

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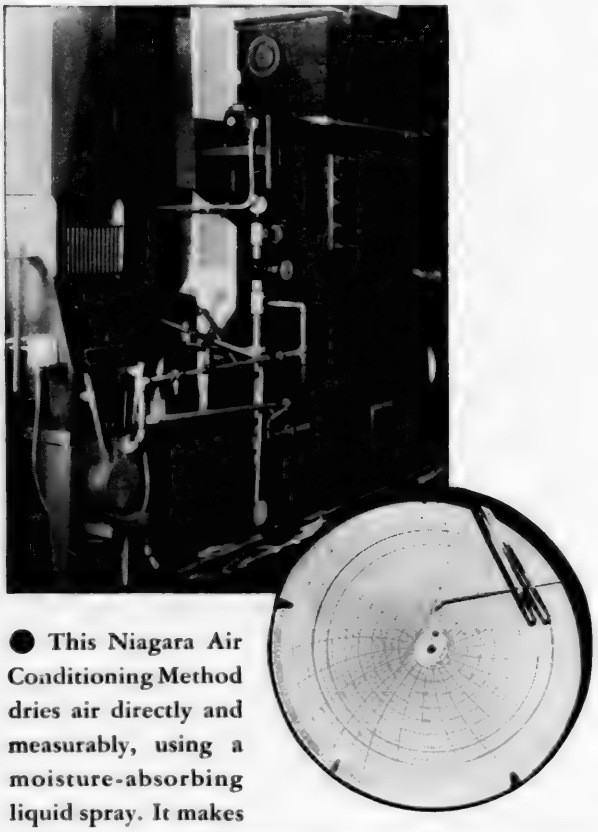

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(*Continued from page 162*)

**INDUSTRIAL VENTILATION CONFERENCE**—Sixth annual Industrial Ventilation Conference, to be held at Kellogg Center, Michigan State University, East Lansing, Mich. Public relations department of Michigan State, E. Lansing, Mich. ..... **FEBRUARY 18-21, 1957.**

**ASHAE MEETING**—63rd annual meeting of the American Society of Heating and Air-Conditioning Engineers, Inc., at the Conrad Hilton Hotel, Chicago, Ill. A. V. Hutchinson, executive secretary of the Society, 62 Worth St., New York 13, N. Y. ..... **FEBRUARY 25-28, 1957.**

**HEATING AND AIR-CONDITIONING EXPOSITION**—13th International Heating and Air-Conditioning Exposition, at the International Ampitheater, Chicago, Ill. E. K. Stevens, manager, International Heating and Air-Conditioning Exposition Co., 480 Lexington Ave., New York 17, N. Y. ..... **FEBRUARY 25-MARCH 1, 1957.**

**CORROSION ENGINEERS MEETING**—13th annual conference and exhibition of the National Association of Corrosion Engineers, at Kiel Auditorium, St. Louis, Mo. A. B. Campbell, executive secretary of the Association, 1061 M & M Building, Houston 2, Tex. ..... **MARCH 11-14, 1957.**

**ATOMIC ENERGY CONFERENCE**—Fifth conference on Atomic Energy in Industry, sponsored by the National Industrial Conference Board, at the Benjamin Franklin Hotel and Convention Hall, Philadelphia, Pa. Public information department of the National Industrial Conference Board, 460 Park Ave., New York 22, N. Y. ..... **MARCH 14-15, 1957.**

**METALS CONGRESS AND EXPOSITION**—10th Western Metal Congress and Exposition, sponsored by the American Society for Metals, and other technical groups, at the Pan-Pacific Auditorium and the Ambassador Hotel, Los Angeles, Calif. W. H. Eisenman, managing director of the Society, 7301 Euclid Ave., Cleveland 3, Ohio. ..... **MARCH 25-29, 1957.**

**GAMA MEETING**—Annual meeting of the Gas Appliance Manufacturers Association, at The Greenbrier, White Sulphur Springs, West Va. H. Leigh Whitelaw, managing director of the Association, 60 E. 42nd St., New York, N. Y. ..... **APRIL 8-10, 1957.**

**REFRIGERATION INSTITUTE MEETING**—Annual meeting of the Air-Conditioning and Refrigeration Institute, at The Homestead, Hot Springs, Va. Executive secretary of the Institute, 1346 Connecticut Ave., N. W., Washington, D. C. ..... **MAY 6-8, 1957.**

**MECHANICAL CONTRACTORS MEETING**—Annual meeting of The Mechanical Contractors Association of America (formerly Heating, Piping and Air Conditioning Contractors National Association) at the Hotel Fontainebleau, Miami Beach, Fla. L. B. Gruman, Jr., secretary of the Association, 30 Rockefeller Plaza, New York 20, N. Y. ..... **MAY 7-10, 1957.**

**DESIGN ENGINEERING SHOW**—Design Engineering Show to be held at the Coliseum, New York City. Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y. ..... **MAY 20-23, 1957.**

**NDHA MEETING**—48th annual meeting of the National District Heating Association, at The Homestead, Hot Springs, Va. J. F. Collins, Jr., secretary-treasurer of the Association, 827 N. Euclid Ave., Pittsburgh, Pa. ..... **JUNE 3-6, 1957.**

**TESTING MATERIALS MEETING**—60th annual meeting of the American Society for Testing Materials, at the Chalfonte-Haddon Hall, Atlantic City, N. J. Secretary of the Society, 1916 Race St., Philadelphia 3, Pa. ..... **JUNE 16-21, 1957.**

**ASHAE MEETING**—Semi-annual meeting of the American Society of Heating and Air-Conditioning Engineers, Inc., at Murray Bay, Quebec. A. V. Hutchinson, executive secretary of the Society, 62 Worth St., New York 13, N. Y. ..... **JUNE 24-27, 1957.**

**CIVIL ENGINEERS EXHIBIT**—Annual meeting and Civil Engineering Show of the American Society of Civil Engineers at Hotel Statler, New York, N. Y. Secretary of the Society, 33 W. 39th St., New York 18, N. Y. ..... **OCTOBER 14-18, 1957.**

**AIR-CONDITIONING AND REFRIGERATION EXPOSITION** — 10th exposition of the Air-Conditioning and Refrigeration industry, sponsored by the Air-Conditioning and Refrigeration Institute, at Chicago's International Amphitheater, Chicago, Ill. Secretary of the Institute, 1346 Connecticut Ave., N. W., Washington 6, D. C. ..... **NOVEMBER 18-21, 1957.**

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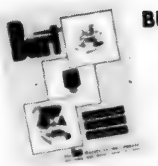

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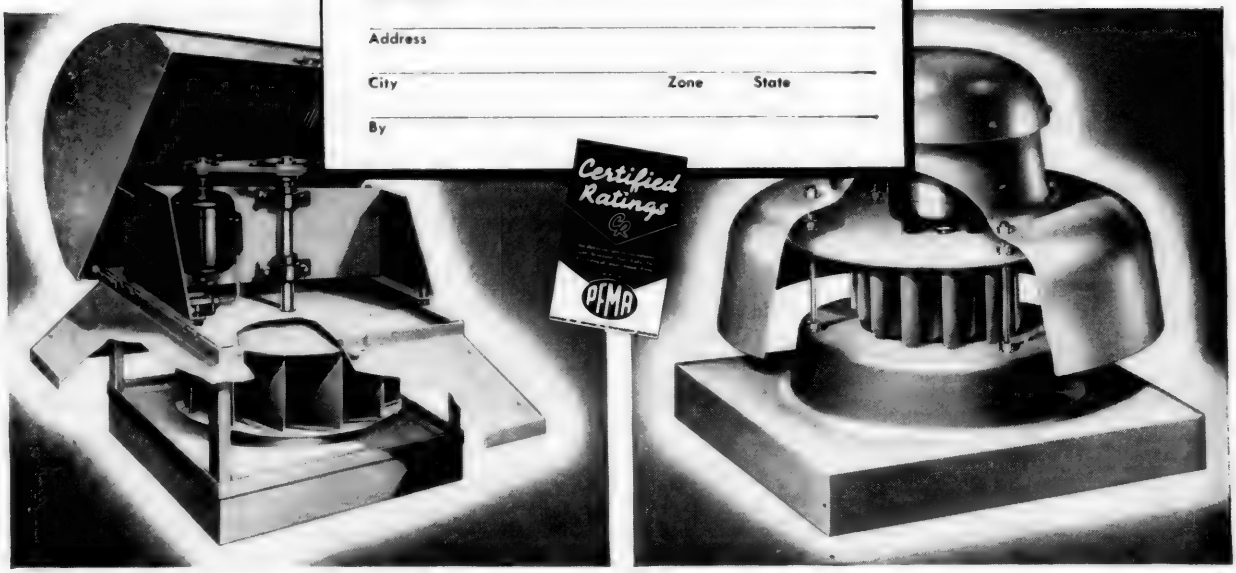


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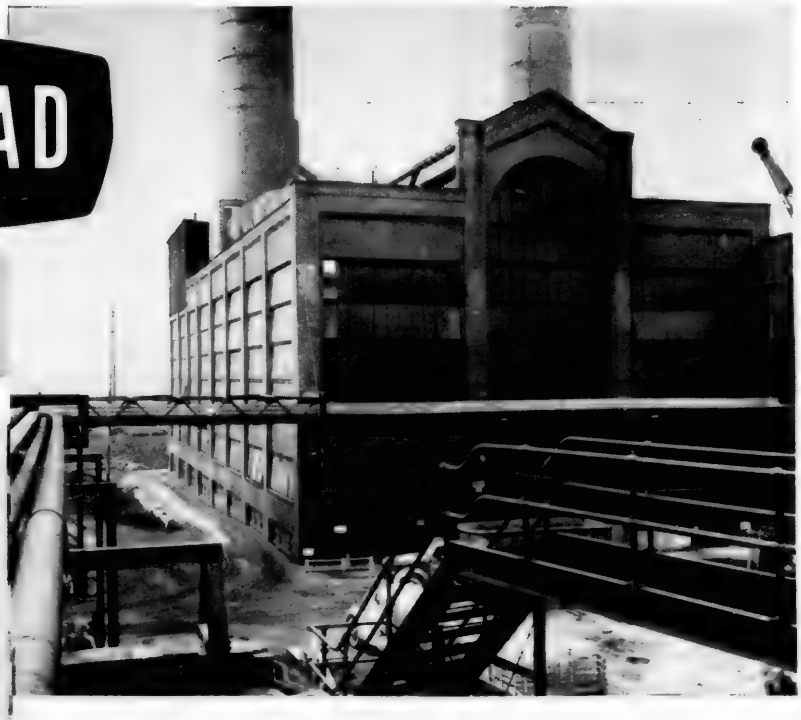

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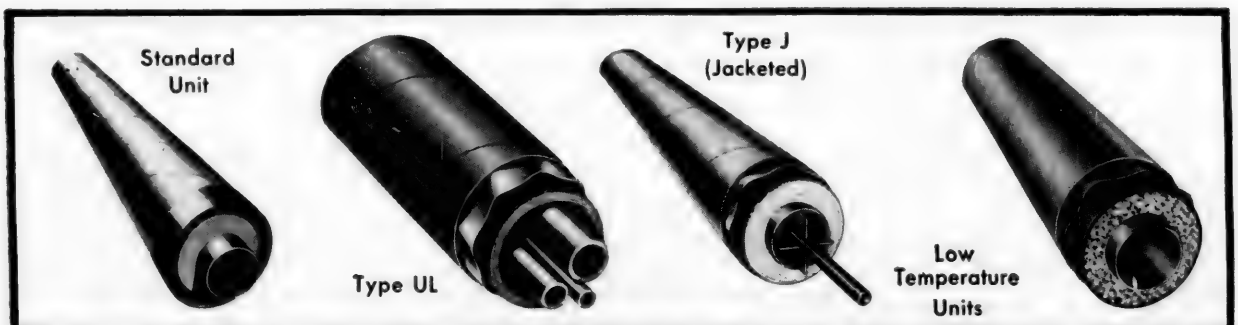


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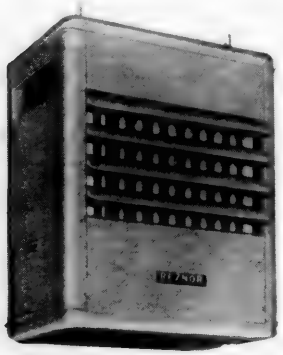

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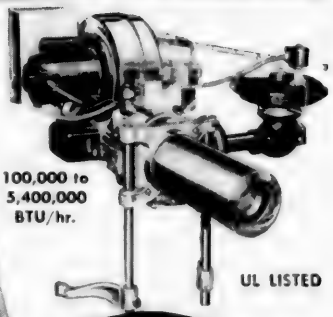

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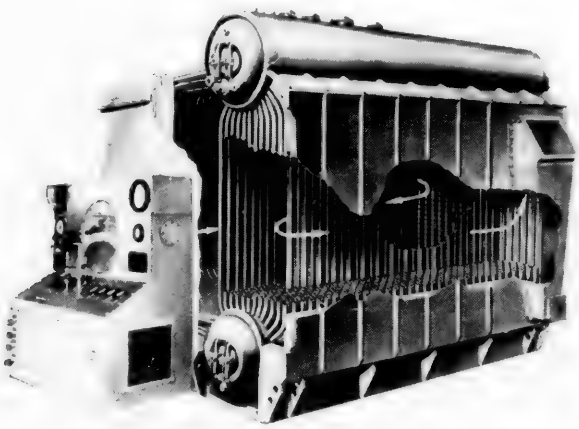

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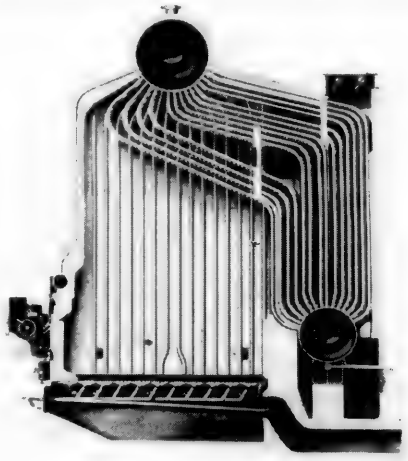

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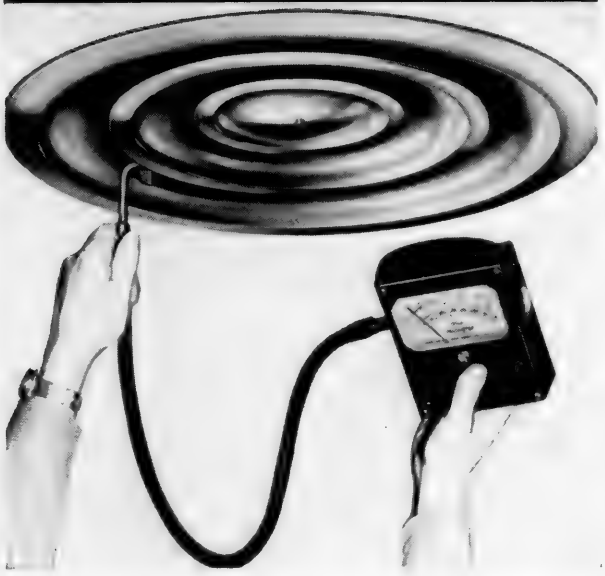
STEAM GENERATING UNITS; NUCLEAR REACTORS; PAPER MILL EQUIPMENT; PULVERIZERS; FLASH DRYING SYSTEMS; PRESSURE VESSELS; DOMESTIC WATER HEATERS; SOIL PIPE

# Alnor VELOMETER

*Recommended by* BARBER-COLMAN *for Precision Air-Flow Readings*



Barber-Colman engineered air distribution products are designed to meet the exacting needs of architects, engineers, and owners.

Proper installation is the all-important final step that assures uniform air distribution equal to design performance.

Alnor Velometers are recommended by this manufacturer for precision air-flow readings on all installations. They have determined in their own laboratory and by field tests that the Alnor Velometer provides a fast and convenient way of checking air velocities and air-flow conditions.

The Velometer is the *only* instantaneous, direct-reading air velocity meter—accurate in all ranges, from high to low—compact, portable, easy to understand and use. Wide assortment of jets and fittings makes this precision instrument ideally suited for all velocity measurement.

For your air measurement needs—get an Alnor Velometer—you'll be glad you did. Use this coupon for quick delivery of details and prices.

ILLINOIS TESTING LABORATORIES, INC.
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Chicago 10, Ill.

☐ Send Bulletin 2448-G
☐ Have Alnor Representative call.

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Company.....

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Alnor **PRECISION INSTRUMENTS FOR EVERY INDUSTRY**

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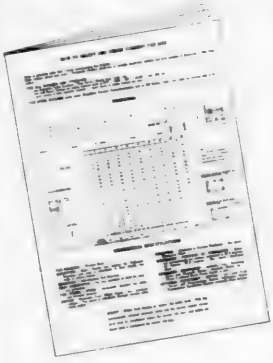
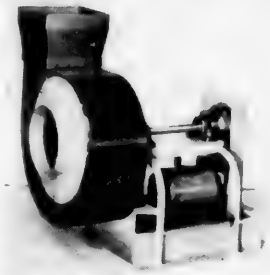
**BETTER MADE**
**MORE FLEXIBLE**
**LARGE RESERVE CAPACITY**

## INDUCED DRAFT FANS





WRITE FOR SIMPLIFIED SELECTION DATA

- Save up to 35% installation costs.
- Fan chassis is steel platform, needing only four pipe floor stands or four ceiling bolts.
- Smaller chimney flue.
- Less costly breeching.
- Stub stack can be fastened to vertical discharge.

**WHITTY** COMPANY, INC.
86 Western Avenue
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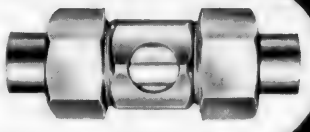
# NEW! "250" SERIES LIQUID EYE®

**POSITIVE SEALING INDICATORS**

designed to save you even more time and money



8 sizes now available: ⅜", ½", ⅝", ⅞", 1⅛" and 1⅜" O.D.S.

The new "250" has all the proved Liquid Eye advantages *plus* these newly engineered features:

- **smaller—more compact, simplified design.**
- **preformed copper extension eliminates need for separate gaskets—*foolproof* installation.**
- **complete, self-contained, economy unit.**

*Ask your wholesaler now.*

*Write today for catalog covering the complete Allin line.*

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410 N. Hermitage Ave. • Chicago 22, Illinois
Over 1,000,000 Liquid Eyes Sold to Date!

## INSULATION News from L·O·F GLASS FIBERS COMPANY

(1) Wrap adhesive-coated duct with blankets of Super·Fine insulation—butting the edges, and securing the blankets with wire. Vapor barrier is completed by (2) applying adhesive at joint and (3) pressing exposed tab of facing material into the adhesive.

# Contractors cut installation costs with vinyl-faced Super·Fine Duct Wrap

*To assure thermal-insulating efficiency and an effective vapor barrier at reduced installation costs, Theodore Rogvoy (A.I.A.) and David J. Zabner (M.E.) selected vinyl-faced Super·Fine insulation to wrap cold-air ducts in Detroit's Eastgate Shopping Center.*

In addition to Super·Fine's high insulating efficiency, you benefit from its ease of application! You will find that even unskilled workmen can apply Super·Fine in a shorter time than other types of insulation! What's more, Super·Fine is . . .

- light weight!
- pleasant to handle!
- easy to cut with an ordinary knife or scissors!
- requires no precise measuring or fitting!
- strong—can be wrapped around ducts and hangers without danger of tearing!
- economical to store—compressed rolls save space, yet insulation springs back to its full thickness!

Super·Fine is available with vinyl and other plain or reflective facings, extended beyond edges of insulation to form tabs. For complete information, check your Yellow Pages for the nearest distributor, or write: L·O·F Glass Fibers Company, Dept. 63-106, 1810 Madison Avenue, Toledo 1, Ohio.

L·O·F GLASS FIBERS SUPER-FINE INSULATION

## L·O·F GLASS FIBERS COMPANY

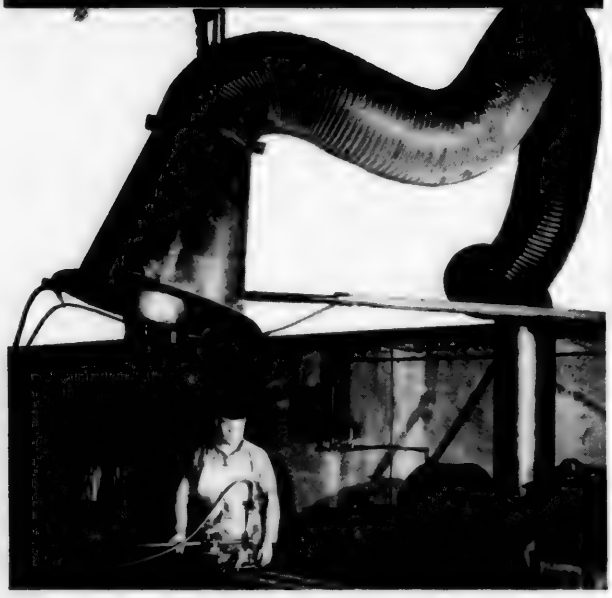
**TOLEDO 1, OHIO**

Makers of glass fibers by the "Electronic-Extrusion" process

# EXHAUST...

## WHEN You Want It
## WHERE You Want It

FOR EVERY INDUSTRIAL APPLICATION



## with FLEXAUST® hose

In a large midwestern chemical plant, 12" I.D. Flexaust Hose is used to exhaust fumes and heat from a flame-cutting operation. The hood to which the Flexaust hose is attached is carried on a movable boom, putting the exhaust exactly where it is needed. Available in 1¼" to 36" I.D.

### EASY TO INSTALL

• Unskilled labor can cut and install Flexaust duct quickly and easily. A set-up like this one can be easily installed and just as easily moved to meet changes of process or relocation of machines. It can be cut to any length, and is easily coupled to any other duct work.

### HIGHLY FLEXIBLE

• No layout problems with Flexaust! Made of nylon or cotton base impregnated with age-resistant Neoprene compound and reinforced with spiral wire, it will not kink or flatten. It maintains its cross-section even on sharp bends. As it has excellent lengthwise compressability, it is easy to transport and store.

### LONG LASTING

• Flexaust is highly resistant to corrosion, moisture, chemical deterioration and flexing fatigue. Its bonded, double ply, double overlap construction makes it fully air-tight for pressure, suction or gravity operations. It outlasts other types of ducts in handling abrasive dusts as in grinding, materials handling, etc.

You can use Flexaust for fume exhaust, for dust or chip collection, for ventilation, for handling of bulky materials. In every application it proves its economy in first cost and simplicity of installation . . . its efficiency in its performance and adaptability to all types of jobs. Also available, retractable type Portovent duct.

Write today for bulletins giving complete data on flow characteristics, installation procedure, sizes, fittings and accessories.

## THE FLEXAUST COMPANY

**Dept. HV-10, 100 Park Avenue, New York 17, N. Y.**

Formerly American Ventilating Hose Co.

**Stocks are available from coast to coast**

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DIVISION OF HUPP CORPORATION

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**for any liquid for high pressures for high temperatures**

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If you have a liquid level control problem that involves a float, send for Harris Float Catalog with its complete technical data on the various types, sizes of floats, and the metals suitable for different corrosive liquids, temperatures, and pressures.

Harris Floats are made in sizes from 2½" to 14" diameter in ball, cylinder, conical, rectangular or disk shapes of Copper, Stainless Steel, Aluminum, Nickel, Monel, or Steel or other suitable, workable metals.

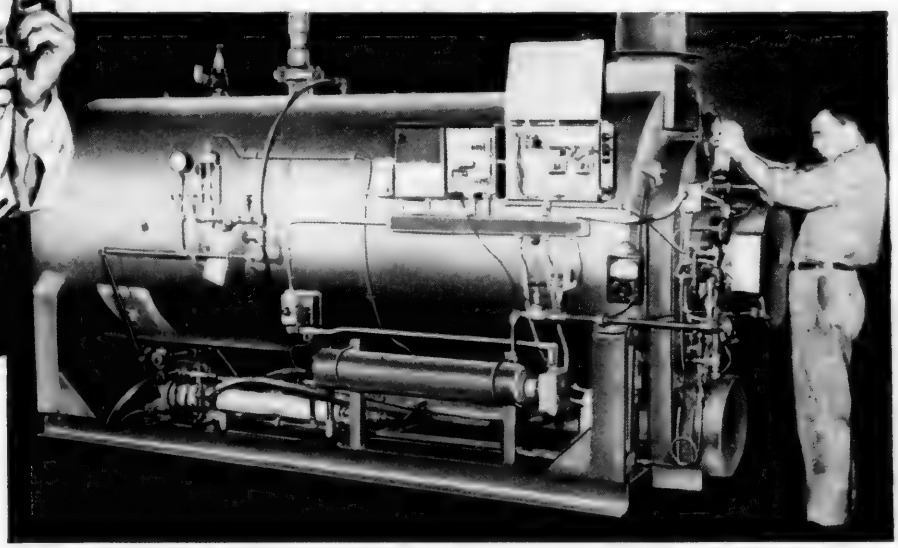
Harris engineers, with a background of 72 years of experience, will be glad to help you select or design the right float for your installation.

**ARTHUR HARRIS & CO.**

206 No. Aberdeen Street, Chicago 7, Illinois

# FLOATS

## "Engineers know the value of an ENGINEERED PRODUCT . . . That's why we like Packaged Boilers"



"As an engineer, I know the importance of using only an engineered, integrated, smoothly functioning unit. That's why I like a Packaged Boiler.

"A built-up fire-tube boiler is usually assembled from unrelated components. Often no two of its parts were specifically designed for simultaneous operation in the same boiler. The result is noise, vibration, rapid sooting, and a general lowering of boiler efficiency.

"A Packaged Boiler, on the other hand, is an engineered product. Every part is specifically designed to function with every other part at maximum efficiency. That means quiet, low-cost operation . . . vibration-free performance . . . soot removal twice a year instead of once a day.

"As an engineer, I know that a Packaged Boiler pays off in satisfactory performance, greater efficiency, less maintenance."

**Six Reasons Why it Pays to Buy a**

**CONTINENTAL**

**Automatic Boiler**

- Guaranteed 80% efficiency . . . Fire-tested before shipment . . . Range, 20 to 500 hp.
- Simple, practical two-pass design, for uniform flow of combustion gases through all return tubes.
- Maximum radiant heat transfer achieved by "Spinning Gas" technique for thorough mixing of air and atomized fuel.
- High-$CO_2$ and low-temperature stack gases — proof of high combustion efficiency.
- Free, rapid water circulation improves heat transfer, keeps heating surfaces clean.
- Easy access to furnace and all return tubes. Refractory baffles and brickwork are not required.

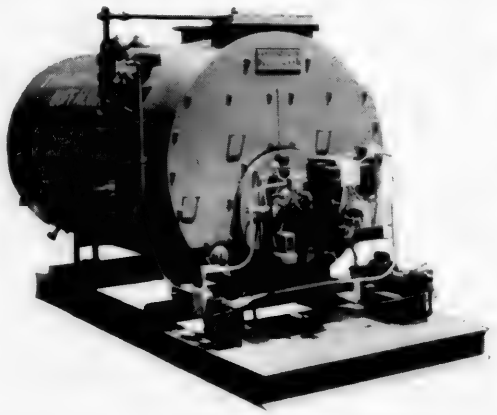
*For details on the Continental Automatic Boiler, send for Bulletin BE-3*

**BOILER ENGINEERING & SUPPLY COMPANY, INC.**

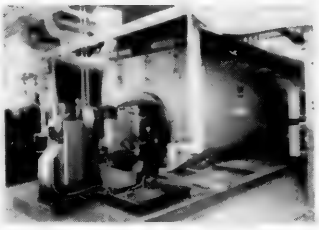
**7 Manavon Street, Phoenixville, Pa.**

A HALF CENTURY OF BOILER MANUFACTURING EXPERIENCE

The Continental AUTOMATIC BOILER



*Two BISON Super Scot Low-Pressure Boilers at Sylvania Electric Products, Inc., Batavia, N. Y. Engineers and General Contractors, Siegfried Construction Co., Inc., Buffalo, N. Y.; Heating Contractors, Joseph Davis, Inc., Buffalo, N. Y.*



**BISON**

## SUPER SCOT BOILERS

### *for packaged heating units*

To the best in the century-old Scotch Boiler with its tried-and-true two-pass design, BISON Super Scot Low-Pressure Boilers offer a number of advantages made possible by their exclusive features.

Per unit of heating surface, Super Scot Boilers are bigger. They have a larger furnace, more steam space and water content. The area directly exposed to the radiant heat of combustion is a greater percentage of the total heating surface. Certified ratings are moderate but extra loads can be handled with larger burners.

Results—smokeless combustion, extra capacity for peak loads, lower maintenance, longer life and less cost of steam generated.

Consult F & T also for high-pressure boilers.

FARRAR & TREFTS DIVISION
ADSCO INDUSTRIES, INC.
20 MILBURN ST. BUFFALO 12, N. Y.

## TAGGED THE FINEST BY HEATING EXPERTS

### PANELBLOC

Where gas — either natural, manufactured or LP is available, the overhead PANELBLOC can be the answer to commercial and industrial heating problems.

This infra radiant heater is low in first cost — economical to install. Needs no electrical connection. No fans, motors or moving parts. Automatic, noise-free operation.

Write for Bulletin.

### THERMOBLOC

Thermobloc Direct fired warm air heaters are installed in almost every type commercial and industrial structure ALL AROUND THE WORLD. World leader in sales, THERMOBLOCS are manufactured and sold in 27 countries.

Full range of sizes, gas, oil or combination gas-oil firing.

Safety and Satisfaction are built right into THERMOBLOC.

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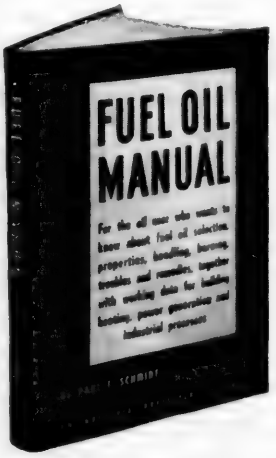


Here is a book that will give you a comprehensive picture of the characteristics and uses of every type and grade of fuel oil. The author explains the meaning of each oily property, and shows how this information is applied to the selection, handling and burning of fuel oil. Impurites and how they effect combustion are described fully, and a special chapter describes fuel oil additives and how they are used. Another chapter lists troubles which may be encountered in using fuel oils, and shows the correct remedy to apply in each case. Technical language is avoided wherever possible, and all terms are fully explained.

160 Pages **$3.50** 34 Tables

In Canada or overseas, $4.20

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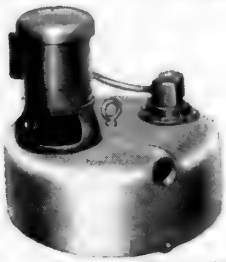
# LOW PRESSURE SYSTEM *Condensate Pumps*

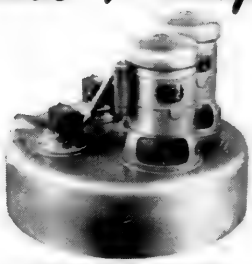


SINGLE UNIT—Fig. 302A
10 Gal. Receiver for Single Units
Diameter 21"
Hgt. of Return above floor 6⅞"

Capacities 500 to 10,000 sq. ft. E.D.R.

## weil TVC PUMP

**LOW RETURN CONNECTION**
**LOW SPEED, LONG LIFE**
**CAST IRON RECEIVER**
**LOW WATER LINE**
**FLOAT SWITCH CONTROL**



DUPLEX UNIT—Fig. 303B
15 Gal. Receiver for Single or Duplex Units
Diameter 25½"
Hgt. of Return above floor 7³⁄₁₆"

**TVC SELECTION TABLE**

| Unit Number | Max. Sq. Ft. E.D.R. | Discharge Pressure At Pump | G.P.M. From Radiation | Cap. of Pump | H.P. of Motor | Return Inlet | Pump Discharge | Dia. of Receiver | Height of Unit |
|---|---|---|---|---|---|---|---|---|---|
| TVC 13 | 500 | 20 lbs. | .25 | 1.0 GPM | 1/4 | 2" | 1" | 21" | 21" |
| TVC 19 | 750 | 20 lbs. | .38 | 1.5 GPM | 1/4 | 2" | 1" | 21" | 21" |
| TVC 23 | 1000 | 20 lbs. | .5 | 1.5 GPM | 1/4 | 2" | 1" | 21" | 21" |
| TVC 29 | 2000 | 20 lbs. | 1.0 | 3.0 GPM | 1/4 | 2" | 1" | 21" | 21" |
| TVC 35 | 4000 | 20 lbs. | 2.0 | 6.0 GPM | 1/4 | 2" | 1" | 21" | 21" |
| TVC 41 | 6000 | 20 lbs. | 3.0 | 9.0 GPM | 1/2 | 2" | 1" | 21" | 23½" |
| TVC 47 | 8000 | 20 lbs. | 4.0 | 12.0 GPM | 1/2 | 2" | 1" | 25½" | 23½" |
| TVC 52 | 10000 | 20 lbs. | 5.0 | 15.0 GPM | 3/4 | 2" | 1" | 25½" | 27½" |

**See Bulletin TVC-300-C for Full Specifications**

**Intermediate Sizes Based Upon Discharge Pressure Required Are Available.**

**weil PUMP CO.** 1516 No. Fremont St., Chicago

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## The Solution to Comfort Heating!

- In Private and General Offices
- For Secondary or Complete Plant Heating

- Warms cool air along walls—under windows.
- Replaces old style radiators.
- Enlarges working space—only 3" deep by 8" high.
- New design cover — flush with floor — avoids accumulation of dust and dirt.

MODERN **BASEBOARD CONVECTORS**

Easy — Simple Installation — Fin Tube and Cover comes in 10-foot lengths.

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**REMPE COMPANY**
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Chicago 12, Illinois

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## Sell the air filter *everybody* likes... *electrostatic*

# DUST-magnet®

Yes, everybody likes the Dust-magnet air filter because it's permanent—lasts for the life of the equipment—and because it does a better job. Dust-magnet's exclusive plastic fabric actually grabs dust and dirt out of the air stream by electrostatic action, even reduces smoke content. It is quickly rinsed clean in a minute or two and replaced.

Dealers like Dust-magnet because it's a fast moving, easy-to-sell profit maker. Ask your jobber about lifetime Dust-magnet air filters, or write for the complete story.

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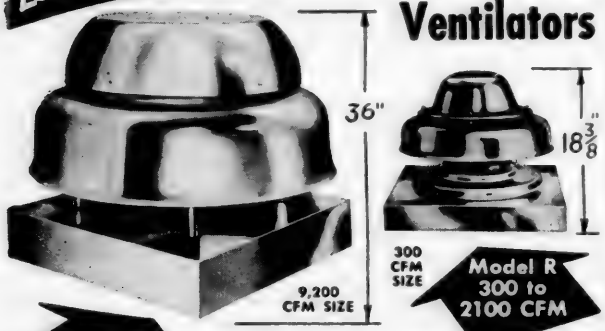
Low Silhouette **COOK Direct Drive Ventilators**




Model R 300 to 2100 CFM

Model BV 300 to 9,200 CFM

**AVAILABLE IN LOW RPM**

Lightweight • Spun Aluminum • Rubber Mounting • Easy Installation • Non-overloading Blower Wheel (Aluminum)

Cook direct drive ventilators are now available in speeds as low as 490 rpm. You can install a Cook direct drive unit where normally only belt drives are used. Low tip speeds for quiet operation. Light starting torque with aluminum blower wheel. Only 6" high roof curb required. All aluminum construction saves hundreds of pounds roof load on large models. Also available are wall ventilators, and belt drive centrifugal ventilators. Write for Catalog HV. In Canada write to H. F. Clarke Ltd., 244 W. Broadway, Vancouver, B. C.

**COOK** VENTILATORS
LOREN COOK COMPANY
Berea, Ohio

These models will be shown in the 1956 SWEET'S FILE



Stuck Valves
Hard-to-Heat Spots
Frozen Pipes

Sluggish Materials
Underheated Rooms

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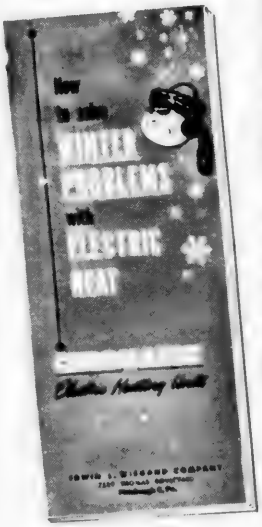


Here's brand new application information on hundreds of uses of Chromalox Electric Heating Equipment for winter weather problems. These factual reports provide you with a rich source of ideas tailored strictly to winter heating problems in and around the plant and office.

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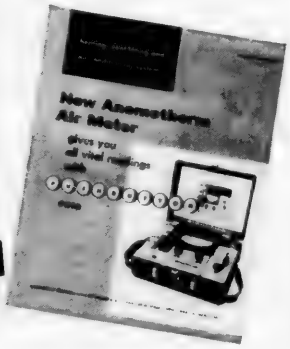
# FREE BULLETIN

*tells how*

## ANEMOTHERM Air Meter




**saves in balancing air conditioning, heating and ventilating systems**

The Model 60 Anemotherm Air Meter, developed by the Anemostat Corporation of America, gives you — *in one convenient instrument* — a simple, rapid method of balancing and checking any air system. It puts at your fingertips, by means of *color-coded* pushbuttons, air velocity, air temperature and static pressure. • The Anemotherm Air Meter pays for itself through time saved on only one major job. **Write for Bulletin 55 giving all the facts.**

AC 1338

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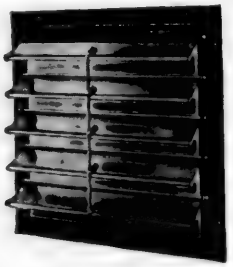


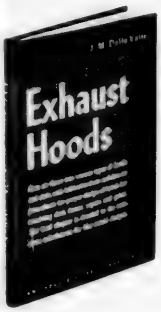
"ELGO" TYPE AUTOMATIC SHUTTER
Front View (Open)

Free CATALOG

**ELGO SHUTTER & MANUFACTURING CO.**
2738 W. Warren Detroit 8, Mich.



# EXHAUST HOODS




**The only book published that gives comprehensive information on the flow of air around and into the openings, hoods or slots in exhaust ventilating systems. Covers all phases of hood, booth and slot design. Shows how to determine the required air volume and velocity for hoods and other types of openings for the control of all kinds of dusts, fumes and gases. Sample problems, with the solutions worked out in detail, are given in a chapter devoted entirely to this matter.**

111 Pages, 127 Illustrations, 30 Tables, $3.50

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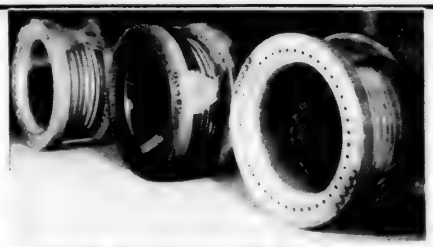
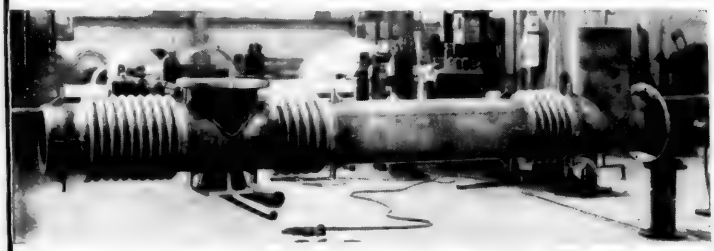
# ADSCO



*Three 48" Hinge-Type Corruflex Expansion Joints*

## ENGINEERING BACKS UP EVERY CORRUFLEX PACKLESS EXPANSION JOINT

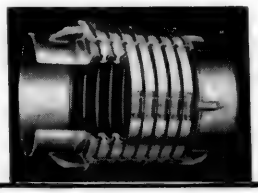


*Complex stainless steel assembly of piping and joints absorbing four different motions*

Regardless of size or degree of complexity of the joint involved, ADSCO applies its vast engineering experience to every piping problem presented to it. The help ADSCO provides not only makes the customer's piping react the way it should but also saves money in both installation and maintenance costs. Next time consult ADSCO, a leader in the development of maintenance-free packless expansion joints.

● *Write for Bulletin 35-51.*

*Basic Corruflex Joint with Equalizing Rings*



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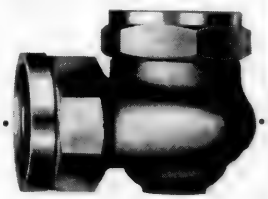

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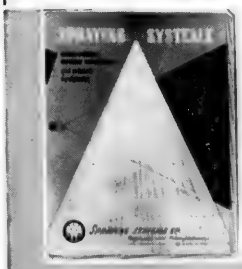

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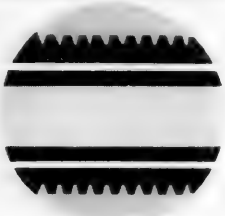

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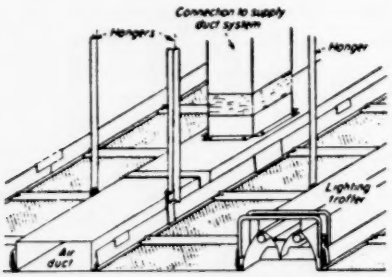


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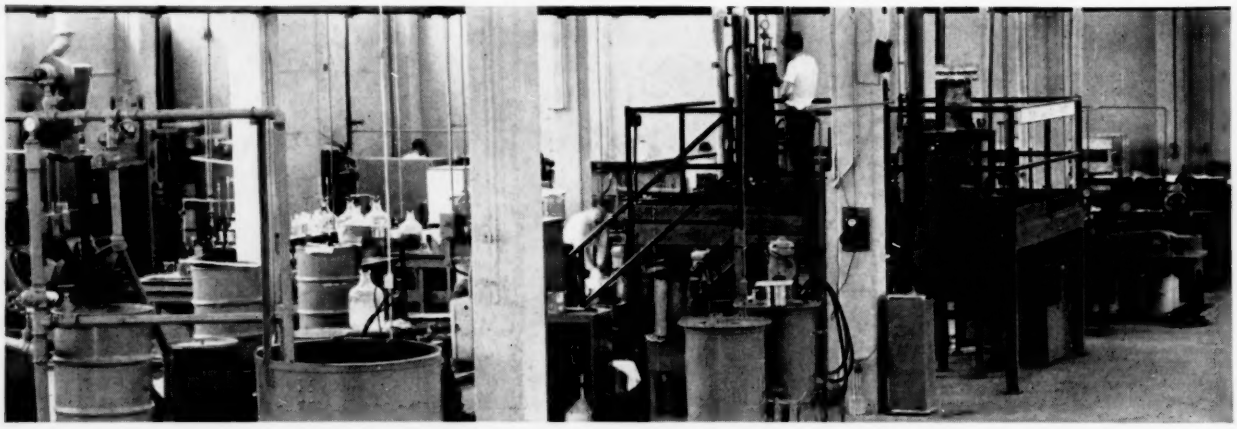

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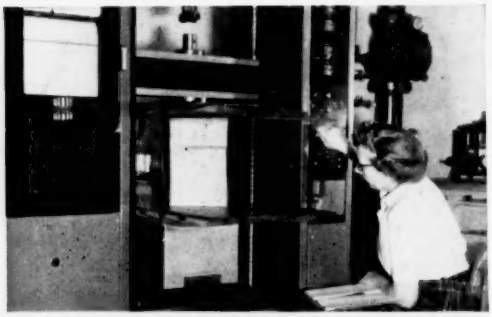

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